

NAVAL POSTGRADUATE SCHOOL

Monterey, California



THESIS

**SURGICAL DEMAND FORECASTING,
STANDARDIZATION, AND CAPITATED SUPPLY
CONTRACTING AT DOD MEDICAL TREATMENT
FACILITIES**

by

Ronald E. David

December 1998

Thesis Advisor:
Associate Advisor:

William R. Gates,
David A. Smith

Approved for public release; distribution is unlimited.

19990120 070

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE December 1998		3. REPORT TYPE AND DATES COVERED Master's Thesis
4. TITLE AND SUBTITLE Surgical Demand Forecasting, Standardization, and Capitated Supply Contracting at DOD Medical Treatment Facilities			5. FUNDING NUMBERS	
6. AUTHOR(S) David, Ronald E., Lieutenant, Medical Service Corps, U.S. Naval Reserve, CHE				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSORING / MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.			12b. DISTRIBUTION CODE	
13. ABSTRACT (maximum 200 words) <p>This thesis evaluates whether DoD can successfully predict surgical demand based on historical operating room usage and catchment area populations at Medical Treatment Facilities. Using sophisticated software, it applies statistical tools to develop surgical incidence rates and projects future year incidence rates based on projected population changes. This thesis focuses on medical logistics regionalization efforts underway throughout DoD and questions if outsourcing is the future of DoD medical logistics.</p> <p>This thesis further delineates a disposable product, surgical and clinical standardization program that DoD can immediately adopt to generate substantial savings in inventory investment. This thesis develops the idea that prepack surgical supplies can generate substantial savings following standardization. This thesis further develops the standardization structure, committee membership, subcommittee membership, and product review criteria for evaluating potential product standardization candidates. Capitated contracting for these prepack surgical kits along with future organization-wide disposable supplies, should be established along the same regions as the existing Tricare Lead Agents.</p> <p>This thesis recommends additional areas of further research to include outsourcing medical logistics functions within DoD, defining supply-side determinants and analyzing their impact on surgical output at MTFs, and capitated supply contracting.</p>				
14. SUBJECT TERMS Surgical Demand Forecasting, Regionalization, Standardization, Outsourcing, Capitated Supply Contracting, Monte Carlo Simulation, Crystal Ball Analysis, Incidence rates.			15. NUMBER OF PAGES 125	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL	

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. Z39-18

Approved for public release; distribution is unlimited.

**SURGICAL DEMAND FORECASTING, STANDARDIZATION,
AND CAPITATED SUPPLY CONTRACTING AT DOD MEDICAL
TREATMENT FACILITIES**

Ronald E. David
Lieutenant, Medical Service Corps
U.S. Naval Reserve,
Certified Healthcare Executive
B.S., Southern Illinois University

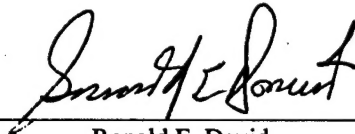
Submitted in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

**NAVAL POSTGRADUATE SCHOOL
DECEMBER 1998**

Author: _____



Ronald E. David

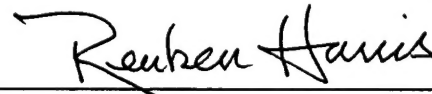
Approved by: _____



William R. Gates, Thesis Advisor



David A. Smith, Associate Advisor



Reuben Harris, Chair
Systems Management Department

ABSTRACT

This thesis evaluates whether DoD can successfully predict surgical demand based on historical operating room usage and catchment area populations at Medical Treatment Facilities. Using sophisticated software, it applies statistical tools to develop surgical incidence rates and projects future year incidence rates based on projected population changes. This thesis focuses on medical logistics regionalization efforts underway throughout DoD and questions if outsourcing is the future of DoD medical logistics.

This thesis further delineates a disposable product, surgical and clinical standardization program that DoD can immediately adopt to generate substantial savings in inventory investment. This thesis develops the idea that prepack surgical supplies can generate substantial savings following standardization. This thesis further develops the standardization structure, committee membership, subcommittee membership, and product review criteria for evaluating potential product standardization candidates. Capitated contracting for these prepack surgical kits along with future organization-wide disposable supplies, should be established along the same regions as the existing Tricare Lead Agents.

This thesis recommends additional areas of further research to include outsourcing medical logistics functions within DoD, defining supply-side determinants and analyzing their impact on surgical output at MTFs, and capitated supply contracting.

TABLE OF CONTENTS

I. INTRODUCTION.....	1
A. BACKGROUND	2
B. RESEARCH QUESTIONS	6
1. <i>Can OSD(HA) predict surgical demand?</i>	6
2. <i>If demand can be accurately predicted, can regional standardization plans be implemented to support capitated supply contracting?</i>	6
3. <i>Can the Defense Supply Center, Philadelphia (DSCP) establish DoD-wide Contracts to support yearly demand for disposable pre-packed surgical supplies?</i>	6
4. <i>What supply-side determinants exist at the MTF level? For example, how many surgeons and what mix of surgeons does a particular MTF have onboard that explains the total amount of surgical cases done within a given year?</i>	6
C. METHODOLOGY	6
D. SCOPE	7
II. METHODOLOGY.....	9
A. THESIS OBJECTIVE	10
B. SELECTION OF CATCHMENT AREA FOR EXPLORATION	10
C. SIMULATION	10
D. STANDARDIZATION PLAN	11
E. CAPITATED SUPPLY CONTRACTING	12
F. CHAPTER SUMMARY	12
III. REGIONAL LOGISTICS AND STANDARDIZATION.....	15
A. INTRODUCTION.....	15
B. REGIONALIZING ADVANTAGES AND DISADVANTAGES	16
C. REGIONALIZATION INITIATIVE BACKGROUND	17
D. CURRENT OPERATIONS	18
E. FUTURE VISION.....	20
F. REGIONAL ALIGNMENT	21
G. MAJOR BUSINESS PRACTICES.....	22
1. <i>Standardization</i>	23
2. <i>Best Value Acquisition</i>	24
3. <i>Regional Maintenance Strategies</i>	24
H. OUTSOURCING	25
1. <i>Outsourcing advantages and disadvantages</i>	28
2. <i>Should DoD outsource all or part of their logistics functions?</i>	29
3. <i>Outsourcing Questions</i>	31
I. CHAPTER SUMMARY	34
IV. DEMAND AND SUPPLY CONSIDERATIONS.....	35
A. SUPPLY CONSTRAINTS	35
B. DEMAND FOR SURGICAL CASES	36
1. <i>Assumptions</i>	36
2. <i>Demand</i>	37
C. CHAPTER SUMMARY	40
V. SIMPLIFIED MATHEMATICAL APPROACH.....	41
A. ASSUMPTIONS.....	41
B. DATA ANALYSIS	42
1. <i>Population Structure</i>	43
2. <i>Selected Surgical Cases</i>	45
3. <i>Incidence Rates</i>	45
4. <i>Simulation and Forecasting</i>	48
5. <i>Chapter Summary</i>	55

VI.	STANDARDIZATION.....	57
	A. INTRODUCTION.....	57
	1. <i>Total Cost Considerations</i>	59
	B. STANDARDIZATION COMMITTEE ORGANIZATION	62
	C. PRODUCT SELECTION PROCESS	65
	1. <i>What products should the MTF commander review first?</i>	65
	2. <i>A Model for Product Review</i>	69
	3. <i>Standardization Pitfalls to Avoid</i>	73
	4. <i>Standardizing Custom Procedure Trays (Prepacks)</i>	75
	D. DAPA DISCUSSION, CURRENT DAPA HOLDERS AND THEIR CUSTOMERS... ..	78
	E. WASTE MANAGEMENT	80
	F. CONFIGURATION MANAGEMENT	82
	1. Product Structure	84
	G. CHAPTER SUMMARY	86
VII.	CAPITATED SUPPLY CONTRACTING.....	87
	A. INTRODUCTION.....	87
	B. MTF ENROLLMENT BASED CAPITATION	88
	C. FLOW OF FUNDING	89
	D. CAPITATED SUPPLY.....	90
	E. PRICE AND POPULATION ADJUSTMENTS.....	92
	1. <i>Price</i>	92
	2. <i>Population</i>	93
	F. ELEMENTS OF RISK.....	94
	1. <i>Price Risk</i>	94
	2. <i>Actuarial Risk</i>	94
	3. <i>Partner Risk</i>	95
	4. <i>Utilization Risk</i>	95
	G. TYPES OF CAPITATED SUPPLY CONTRACTS	96
	1. <i>Bill of Material</i>	96
	2. <i>Product Line</i>	96
	3. <i>Total Supplies</i>	97
	H. CHAPTER SUMMARY	98
VIII.	CONCLUSION AND RECOMMENDATIONS.....	101
	A. SUMMARY OF ANSWERS TO RESEARCH QUESTIONS	101
	1. <i>Can OSD(HA) predict surgical?</i>	101
	2. <i>If demand can be accurately predicted, can regional standardization plans be implemented to support capitated contracting?</i>	101
	3. <i>Can the Defense Supply Center, Philadelphia (DSCP) establish DoD-wide regional contracts to support yearly demand for disposable pre-pack surgical supplies?</i>	101
	4. <i>What supply-side determinants exist at the MTF level? For example, how many surgeons and what mix of surgeons does a particular MTF have onboard that explains the total amount of surgical cases done within a given year?</i>	102
	B. CONCLUDING COMMENTS	102
	C. CONCLUSIONS.....	104
	1. <i>OSD(HA) should regionalize medical logistics assets around existing Tricare Lead Agent Regions</i>	104
	2. <i>OSD(HA) should outsource non-governmental medical logistic functions following regionalization</i>	104
	3. <i>OSD(HA) should be able to predict demand for surgical procedures at individual MTFs</i>	105
	4. <i>Currently, there is not OSD(HA)-wide initiative to standardize</i>	

<i>nondurable supplies at Medical Treatment Facilities.....</i>	105
5. <i>Medical Treatment Facilities are budgeted on a per beneficiary, per year basis. Likewise, nondurable supply consumption should be capitated as discussed in this thesis.....</i>	106
C. RECOMMENDATIONS.....	107
1. <i>Define supply-side determinants and analyze their impact on surgical output at MTFs.</i>	107
2. <i>Standardize all nondurable surgical and clinical supplies throughout MTFs.....</i>	107
3. <i>Determine if outsourcing all or part of the medial logistics functions at MTFs is beneficial to the overall mission of navy medicine. Define the outsourcing impact on mission readiness.</i>	107
4. <i>Using demand forecasting as the foundation, investigate and further develop and capitated supply contracts around already existing Tricare Lead Agent regions.....</i>	107
INITIAL DISTRIBUTION LIST.....	109

LIST OF FIGURES

Figure 1	Healthcare Spending 1960-1996	2
Figure 2	O & M Resources	4
Figure 3	Aggregate Population Changes FY97-99	5
Figure 4	DoD Health Service Regions	22
Figure 5	Outsourcing Expenditures	27
Figure 6	Population Structure	44
Figure 7	1999 Forecast Hernia's	50
Figure 8	1999 Forecast C-Sections's	51
Figure 9	2000 Forecast Hernia's	53
Figure 10	2000 Forecast C-Section's	54
Figure 11	Departmental Inventory as a Percent of Total Hospital Inventory	60
Figure 12	Product Standardization Organizational Chart	64
Figure 13	Surgical Standardization Sub-committee	65
Figure 14	ABC Analysis Based on Sales	67
Figure 15	Product Review Matrix	69
Figure 16	Product Review Process	72
Figure 17	Prepack Levels	85
Figure 18	MTF Annual Funding Formula for Supplies	91

LIST OF TABLES

Table 1	DoD Medical Resources FY97-99	4
Table 2	Changing Beneficiary Population FY97-99	5
Table 3	FY98 Total Population	43
Table 4	Beneficiary Percentages	44
Table 5	Active Duty Surgical Cases (1997)	46
Table 6	Incidence Rates for Selected Surgical Procedures (1997)	47
Table 7(a)	Active Duty (18-24)	49
Table 7(b)	FMAD (25-34)	49
Table 8(a)	1999 Forecasts (Active Duty)	52
Table 8(b)	1999 Forecasts (Dependents)	52
Table 9	Forecast Surgical Cases for Active Duty (CY2000)	55
Table 10	North Atlantic Regional Medical Command Standardization Results	76
Table 11	North Atlantic Regional Medical Command Standardization Results	77
Table 12	Custom Procedure Tray DAPA Holders	78
Table 13	Custom Procedure Tray DAPA Holders	79

I. INTRODUCTION

Today, more than ever, military and civilian hospitals are under constant pressure to achieve considerable savings. Improving various purchasing and logistic strategies are the two areas where real savings can occur in the future Military Health System. The mission of the Military Health System is to:

provide top quality health services, whenever needed in support of military operations, and to members of the Armed Forces, their families, and others entitled to DoD [Department of Defense] health care.¹

The purpose of this research is to develop an economic model that predicts demand for surgical procedures based on catchment area demographics at any Military Treatment Facility (MTF). Given that demand can be accurately forecasted and that a pre-pack standardization program can be implemented throughout military medicine, the Department of Defense (DoD) should be able to establish contracts with incentive pricing to purchase disposable, customized pre-packed surgical supplies. The goal is to achieve cost savings and increase operating room efficiency using accurate forecasting - and efficiently contracting for disposable surgical supplies.

¹ [Health Affairs - 1995, p.1].

A. BACKGROUND

Healthcare expenses continue to rise at alarming rates throughout the United States. The Health Care and Finance Administration (HCFA) releases annual expenditure figures detailing several cost categories.² As figure (1) illustrates, expenses grew for health services and supplies at an alarming rate between 1980 and 1990. Although some of this can be attributed to inflation, most of this is growth from other sources.

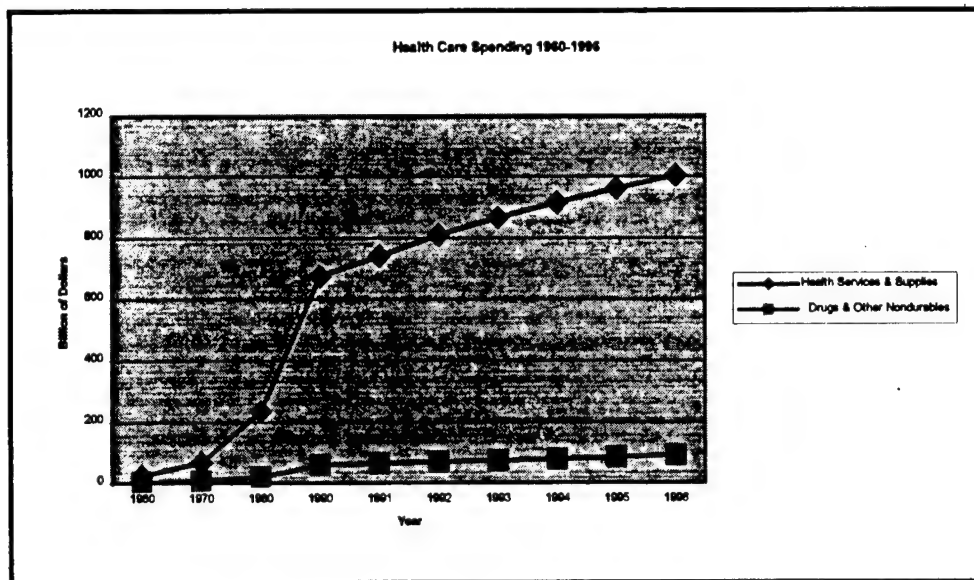


Figure (1): Healthcare Spending 1960-1996³

Health care expenditures are never "too high" or "too low" in a timeless absolute sense; rather, they have been

² Health Care Finance Administration website.

³ National Health Expenditures Aggregate Amounts and Average Annual Percent Change, by Type of Expenditure: Selected Calendar Years 1960-1996 In Billions of Dollars

growing faster than national income and expenditures in other areas. Yet there is a fundamental asymmetry in governmental control of health expenditures. It is easier to spend more than to spend less. With operating budgets under constant pressure, MTF commanders are constantly challenged to look for additional savings, using whatever strategy they can, to bring their expenses in line with higher authority financial directives.

Minimizing cost doesn't necessarily equate to closing hospital doors or discontinuing services. By developing alliances with managed care contractors through resource sharing agreements - and by eliminating wasteful spending by bringing the patient back into the MTF, the MTF can deliver the most cost-effective care. More important, reducing costs to meet Operational Target (OPTARs) budgets means making wiser business decisions.

According to the President's Fiscal Year (FY) 1999 budget, resources will continue to dwindle at a faster rate than eligible beneficiaries.⁴ Table (1) shows the Medical resources budgeted between fiscal year 1997 and fiscal year 1999. There is a -2.75% and -10.33% change in Operations and Maintenance (O&M) and Procurement funding between fiscal year 1998 and fiscal year 1999.

⁴ Military Health System strategic plan. (1998).
www.ha.osd.mil/ppc/strat_ov.html

DoD Medical Resources FY97-99				
		FY97	FY98	FY99
O&M		\$9,747,744.00	\$9,927,307.00	\$9,653,435.00
Procurement		\$344,817.00	\$448,768.00	\$402,387.00
	Subtotal	\$10,092,561.00	\$10,376,075.00	\$10,055,822.00
MILPERS		\$5,164,832.00	\$5,186,522.00	\$5,312,754.00
	Subtotal	\$15,257,393.00	\$15,562,597.00	\$15,368,576.00

Table(1): DoD Medical Resources FY97-99

This negative trend will continue as long as appropriations for Defense Health Affairs continue to be cut. Figure (2) depicts the changes in O&M funding graphically.

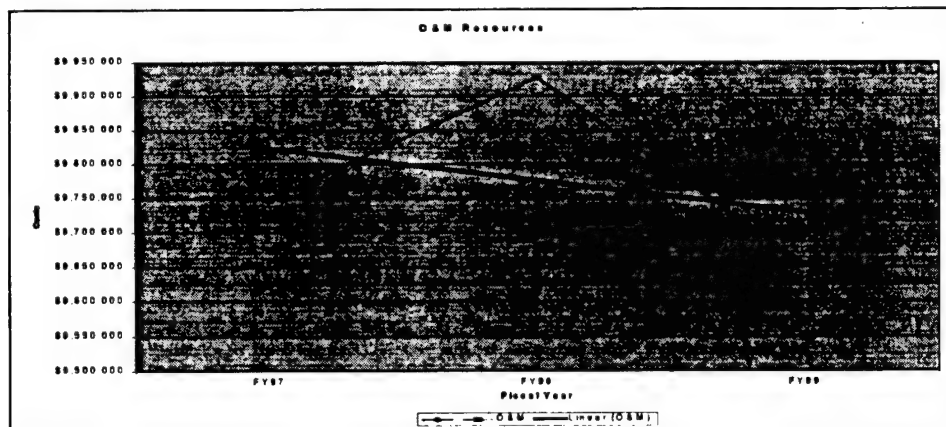


Figure (2): O & M Resources

Likewise, there has been a steady decline in beneficiaries. Unfortunately, the budget is declining quicker than the beneficiary population. Table (2) depicts the changing beneficiary population over the last three fiscal years. Every beneficiary population category has decreased. This decrease, however, does not compensate for

the drastic cuts experienced by the Office of the Secretary of Defense, Health Affairs (OSDHA).

	FY97	FY98	FY99	FY98/99 %Change
Staffing				
Military	103,888	102,055	99,494	-2.57%
Civilian	42,297	41,776	40,891	-2.16%
Total	146,185	143,831	140,385	-2.45%
Facilities				
Hospitals	115	108	102	-5.88%
Clinics	471	480	489	1.84%
Total	586	588	591	0.51%
Population				
	FY97	FY98	FY99	FY98/99 %Change
Active Duty	1,607,519	1,576,613	1,542,213	-2.23%
Family Members	2184797	2159670	2112241	-2.25%
CHAMPUS Eligible Retired	724550	719452	714591	-0.68%
CHAMPUS Eligible Family Mbr. Retired	1236121	1223053	1210832	-1.01%
Subtotal	4,145,468	4,102,175	4,037,664	-1.60%
Medicare Eligible Beneficiaries	347707	365229	380415	3.99%
Total	6,100,694	6,044,017	5,960,292	-1.40%

Table (2): Changing Beneficiary Population FY97-99

Figure (3) graphically depicts the total aggregate population changes since FY97.

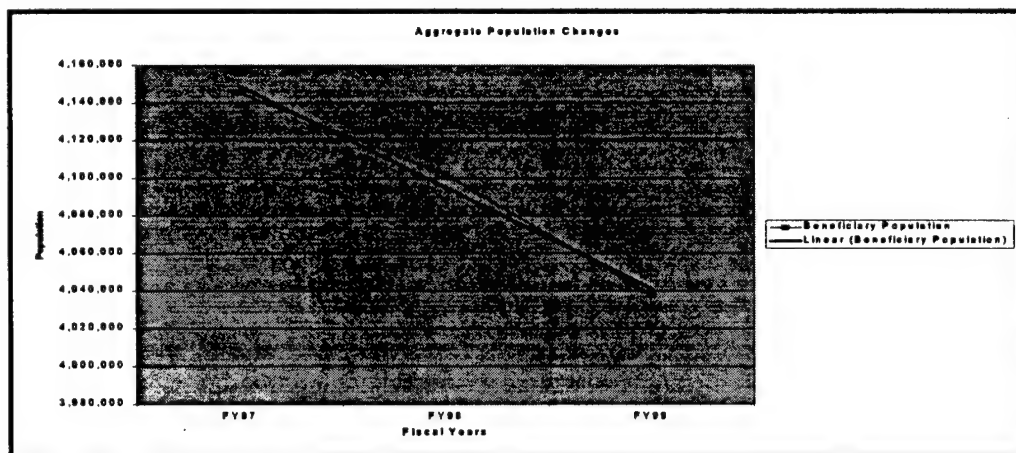


Figure (3): Aggregate Population Changes FY97-99

B. RESEARCH QUESTIONS

This thesis analyzes the primary question: Based on catchment area demographics, can OSD(HA) use simulation software and multiple linear regression analysis to predict the demand for surgical care at MTF's?

1. Can OSD(HA) predict surgical demand?

(Questions two through four are contingent on the fact that number one is yes)

2. If demand can be accurately predicted, can regional standardization plans be implemented to support capitated supply contracting?

3. Can the Defense Supply Center, Philadelphia (DSCP) establish DoD-wide Contracts to support yearly demand for disposable pre-packed surgical supplies?

4. What supply-side determinants exist at the MTF level? For example, how many surgeons and what mix of surgeons does a particular MTF have onboard that explains the total amount of surgical cases done within a given year?

C. METHODOLOGY

This research effort investigates the unique factors that define an MTF's catchment area. Looking at demographic information (gender, status, age, etc.) along with available MTF resources (equipment, number of operating rooms, and a breakdown of physicians by specialty), this thesis hypothesizes that demand can actually be predicted and

consumable supplies can be purchased using a contract. The challenges are to determine:

- Who is the decision authority regarding standardization for disposable supplies?
- Can physicians be incentivized to ally themselves with a single product for an extended period of time?
- Can these contracts be regionalized like most Medical/Surgical and Pharmaceutical Prime Vendor contracts?
- Does the Competition in Contracting Act of 1984 prohibit the DoD from entering contracts with a single distributor?

D. SCOPE

As a means of examining this broad area of concern, this thesis will focus on the following:

- Using existing data provided by the Naval Hospital Camp Pendleton's Managed Care Department, develop a matrix showing population percentages and demand for surgical care by beneficiary category.
- Define supply-side (physician, capital) and demand-side (patient by surgical procedure) constraints that limit surgical demand.
- Once historic demand for surgical procedures has

been characterized, use Crystal Ball® Software to accurately forecast future demand using a 95% confidence level.

- Research a plan to standardize disposable pre-packed surgical supplies. Standardization is crucial to establish capitated supply contracting. One standardization plan may not satisfy requirements throughout the Navy or DoD. Multiple regional plans will more than likely be required.
- Given a firm standardization plan, Defense Supply Center Philadelphia (DSCP) can contract with a single distributor or integrator for all their pre-packed surgical supplies. This contract will serve all DoD and will be tailored to meet a particular region's needs as defined in their standardization plan.

II. METHODOLOGY

A. THESIS OBJECTIVE

Because of the myriad of resources required to provide quality health care, developing efficient medical/surgical supply is imperative. Optimizing resources is both a desirable and worthwhile pursuit in this current era of sweeping cuts in OSD(HAS) healthcare budget. Therefore, the objective of this thesis is to devise a method for forecasting surgical demand. To accomplish this, correlation and regression analysis are defined along with elements of a regression model. Attempts are made to quantify the relationships between two or more of the variables within the health care delivery system. Of chief concern is describing or estimating the value of one dependent variable on the basis of one or more other explanatory variables.

The nature of the relationships between variables is described in the study. Correlation analysis is then used to determine the strength of the relationships found.

Considering time constraints and data availability, linear regressions are used as a template for demonstrating how DoD could use regression analysis to estimate the relationship between total population and surgical procedures. The limited data obtained from the NHCP does

not lend itself well to regression analysis. Therefore, this thesis will estimate incidence rates based on total population and surgical procedures performed from 1996 to 1998.

B. SELECTION OF CATCHMENT AREA FOR EXPLORATION

Naval Hospital, Camp Pendleton (NHCP), was chosen as the focus of this study for many reasons. The command is close in proximity to the Naval Postgraduate School. Professional relationships have been forged with NHCP staff members, facilitating data gathering. The analysis was limited to specific inpatient surgical and managed care data as a first step in developing the demand model.

Finally, the NHCP was selected because it represents a medium sized naval medical facility. Its population represents a cross-section of all beneficiaries found throughout military medicine. The homogenous population is important to draw inferences and apply this mathematical model.

C. SIMULATION

This thesis forecasts total demand by looking at historical data generated by the Naval Hospital, Camp Pendleton, and local managed care surgical cases by applying simulation using Crystal Ball® Software. The analysis forecasts demand using a 95% confidence interval. Estimated

incidence rates, along with forecasted population demographics will provide the basis to a formal standardization plan and capitated supply contracting.

D. STANDARDIZATION PLAN

This thesis outlines a clinically-driven plan for standardizing disposable surgical supplies throughout Department of Defense. Successful implementation of the product standardization program involves breaking down product lines by:

- ☐ High-volume, low-tech, non-controversial products,
- ☐ Unique (one-of-a-kind) disposable products,
- ☐ Controversial items which are strictly physician preference.

An important issue here is whether to standardize on a facility or a regional basis. Interviews regarding this issue were held with cognizant personnel from Walter Reed Army Medical Center, DSCP, St. Johns Medical Center in Springfield, Illinois, Service Medical Consulting in Springfield, Illinois, and healthcare consultants. Once a standardization program is implemented, DSCP should seek a capitated contract with a distributor or manufacturer that can meet DoD's requirements. Hospitals throughout DoD can use existing network connections to order directly from the selected vendor. Standardization should facilitate discount pricing based upon committed volumes.

E. CAPITATED SUPPLY CONTRACTING

The cost saving functions will be standardizing supplies to eliminate stock variances, maximizing the use of electronic purchases (EDI), and creating capitated supply contracts that use an incentive pricing structure. This structure would establish a mechanism whereby the government and the contractor will share in the annual savings or loss. The contractor is incentivized to reduce the overall cost of nondurable supplies using various strategies defined in this thesis. Further savings will be realized by achieving economies of scale. The final contract should be a fixed-price (per beneficiary, per year) with incentive financial rewards defined annually as a percentage of savings generated by the contractor or government. The savings and loss ratio is beyond the scope of this thesis but is recommended for follow on research. Substantial savings can be realized by consolidating demand and converting purchasing practices from multiple ordering entities to a single-volume contract can achieve group purchasing power and obtain economies of scale. The capitated supply contract mechanism will most likely occur through the existing medical Prime Vendor program. The Prime Vendor is a single distributor of commercial, brand name supplies for customers in a specific geographic region. It encompasses both pharmaceutical and medical/surgical commodities. The

pricing in the prime vendor program is supported via the Distribution and Pricing Agreements (DAPAs). These DAPAs are manufacturers agreements with the Defense Supply Center Philadelphia (DSCP) to distribute their products through the DSCP Prime Vendor program. DAPA pricing agreements and their impact will be discussed in later chapters.

F. CHAPTER SUMMARY

The Prime Vendor program is a regional group purchasing initiative that maximizes the united purchasing power of all DoD MTFs within a previously designated health services region. As such, Prime Vendor promotes product and price comparisons, market share agreements, committed volume, and equipment and maintenance contracts. The Prime Vendor program establishes specific guidelines, and provides a singular medical logistics point of contact within each region. Additionally, any attempt at standardizing surgical packs must be clinically driven.

III. REGIONAL LOGISTICS AND STANDARDIZATION

A. INTRODUCTION

This chapter examines regional logistics and standardization initiatives as they relate to the National Capital Area (Washington, D.C.). There is a plan being developed to regionally co-locate most, if not all, medical logistic operations under a single regional authority.⁵ Future standardization at the MTF level presumes that logistic operations will be totally different in five to ten years. Therefore, initiatives undertaken should be aligned under this centralized organization.

OSD(HA) Policy 98-013, dated 23 January 1998, established regional tri-service medical logistics support programs.⁶ The objective of the guidance is threefold:

1. To define the role of the program's executive agent(EA) and to extend this role, based on the authority of the EA, to regional lead agents.
2. To establish management and organizational business units that will facilitate and guide regional logistics support for Medical Treatment Facilities.
3. To establish regional, tri-service medical logistics business practices for obtaining best-value logistics support.

⁵ Regional Tri-Service Medical Logistics Support Program Implementation Guidance (18 Aug 98). Prepared by the Office of the Surgeon General, U.S. Army.

⁶ Policy for Regional Triservice Medical Logistics Support Programs. Internet address:
<http://ww.ha.osd.mil/projs/dmlss/rtml9813.html>

Regional logistics management operations will provide important cost savings (estimated by industry at 10-25% of current product prices) through careful product and service selection, reductions in the number of different items being purchased, regionally pooled buying practices, and capitated supply contracts with manufacturers, distributors, and other contractors.⁷ The plan regionalizes current medical logistics management processes, which have historically been conducted independently at the MTF level.

B. REGIONALIZING ADVANTAGES AND DISADVANTAGES

There are advantages and disadvantages to regionalizing medical logistic operations. Some advantages include:

- ☐ Procurement economies of scale.
- ☐ Reduced MTF logistic operations.
- ☐ Centralized authority for product selection and standardization initiatives.
- ☐ Reduction in MTF Full-time-equivalents (FTE's).
- ☐ Regionally negotiated supply contracts with distributors or manufacturers.
- ☐ Alignment under existing Tricare Lead Agent regions.
- ☐ Joint operations resulting in total-force logistics awareness.
- ☐ Regional capital equipment management.

⁷ Efficient Healthcare Consumer Response. Improving the Efficiency of the Healthcare Supply Chain (Nov 1996). CSC Consulting, Inc.

Some of the potential disadvantages include:

- ☐ Perceived loss of power to the MTF commander.
- ☐ Added level of institutional bureaucracy.
- ☐ Potential loss of funding for existing personnel, supplies, and equipment.
- ☐ Less personalized services that are typically offered by an on-site MTF logistician.

Regionalization should follow along existing Tricare lead agent regions. Options, such as consolidating nationally or by region, or consolidating all medical logistics functions or some, are beyond the scope of this thesis. An exhaustive cost-benefit analysis must be performed to weigh the aforementioned options and their associated impact on military medicine. This thesis assumes that any consolidation of medical logistics functions will be completed regionally, not nationally.

C. REGIONALIZATION INITIATIVE BACKGROUND

In late 1997, a study commissioned jointly by the Acting Assistant Secretary of Defense (Health Affairs) (ASD(HA)) and the Assistant Secretary of Defense (Comptroller) issued eight broad recommendations to improve the effectiveness and efficiency of tri-service managed healthcare operations within the military healthcare system (MHS). Two of the eight recommendations impacted medical logistics by directing the DoD to establish regional, tri-

service medical materials and biomedical maintenance programs in each DoD healthcare region.⁸ The recommendations instigated the ASD(HA)-led Medical Consolidation Initiative. The Army was designated as the Executive Agent for the regional programs, and the Army's Deputy Surgeon General was named as the principal official. The regional operations are to capture cost savings and efficiencies through regional actions, and optimize their use of available commercial support.

D. CURRENT OPERATIONS

Medical logistics in the MHS is big business. The MHS is a \$15 billion per year entity. As a rule of thumb, private sector consulting firms estimate that 40% of a healthcare system's costs are logistical.⁹ Of that, roughly half involves nurses, technicians, and other clinicians. The remaining half can be traced directly to materials management, biomedical maintenance, and facilities management processes commonly found in the logistics operations of DoD's MHS. This means that medical logistics accounts for approximately \$3 billion of the \$15 billion spent on defense health. According to the Tri-Service

⁸ Martin, E., D., (23 Jan 98). Policy for Regional Triservice Medical Logistics Support Programs.

⁹ Hughes, T. (1997). Concepts in Healthcare, Inc. Waltham, MA.

Medical Logistics Support Program's implementation guidance, the single largest element of logistics operations is medical materials acquisition.¹⁰ Medical materials cost the Department of Defense approximately \$2 billion annually.¹¹

Programs such as prime vendor have been hugely successful because they drive inventory out of DoD's warehouses, dramatically reduce logistics cycle times, and permit pricing analysis and improved item selection at the facility level. These savings have been primarily realized at the local MTF level. Accepted commercial practices, such as standardization, consolidation of buying power through aggregated consumption tracking, and volume purchasing are only used on a very limited basis. Regionally centralizing material logistics functions could save DoD millions; enabling DoD to negotiate regional contracts and capture substantial savings through economies of scale.

E. FUTURE VISION

Jointness and shared resources and responsibility are the wave of the future. For example,

¹⁰ Ibid.

¹¹ Functional Economic Analysis for Defense Medical Logistics Standard Support, Office of the Assistant Secretary of Defense (Health Affairs), 1996.

The nature of modern warfare demands that we fight as a joint team. This was important yesterday, it is essential today, and it will be even more imperative tomorrow. Joint Vision 2010 provides an operationally-based template for the evolution of the Armed forces for a challenging and uncertain future. It must become a benchmark for Service and Unified command visions. -- General John Shalikashvili, CJCS, Joint Vision 2010.

Regionalizing medical logistics efforts today will align future systems with Joint Vision 2010. One of the four operational concepts of Joint Vision 2010 is Focused Logistics. Focused Logistics transitions the Department of Defense from a World War II concept of operations to the post-cold war era where best commercial practices, focused logistics, Group Purchasing Organization (GPO) involvement, just-in-time inventory management, and surgical custom procedure trays are among the initiatives being developed.

MHS logisticians are moving away from the MTF view of logistics management, in which purchasing, management, warehousing, distribution, and maintenance of medical supplies and equipment are conducted independently by each MTF. The new view involves regional logistics management of materials, services, and information using commercial-off-the-shelf (COTS) state-of-the-art information technology systems. According to the Implementation Guidance,¹² there are four regional logistics management imperatives:

¹² Ibid.

1. Clinically driven standardization programs will reduce the number of different products within specific product lines to allow for volume discounts.

2. Purchasing methods and processes will be geared toward best value purchasing to obtain the lowest delivered cost for supplies and services.

3. Information about contracts, equipment status, product purchasing, pricing, distribution, consumption, and other acquisition activities will be available across and between OSD(HA) healthcare regions.

4. Information flows based on electronic commerce (EC) functionality will provide feedback to monitor local and regional buying patterns and to improve compliance with standardized product formularies or portfolios.

This vision of future MHS logistics is to be implemented over a 5-year period; the benefits of standardization, integration with regional suppliers and pooled purchasing power will be realized throughout the implementation. Standard logistics practices, metrics, and procurement should be developed to minimize variation throughout the regional organizations.

F. REGIONAL ALIGNMENT

Realignment will, in general, match existing regional alignments resulting from the Tricare Lead Agent reorganization. Figure (4) indicates current Tricare regions and their respective Lead Agent. Medical Logistics Business Units will be established within these regions. Their sole responsibility is standardizing and consolidating all material logistics efforts within the region.

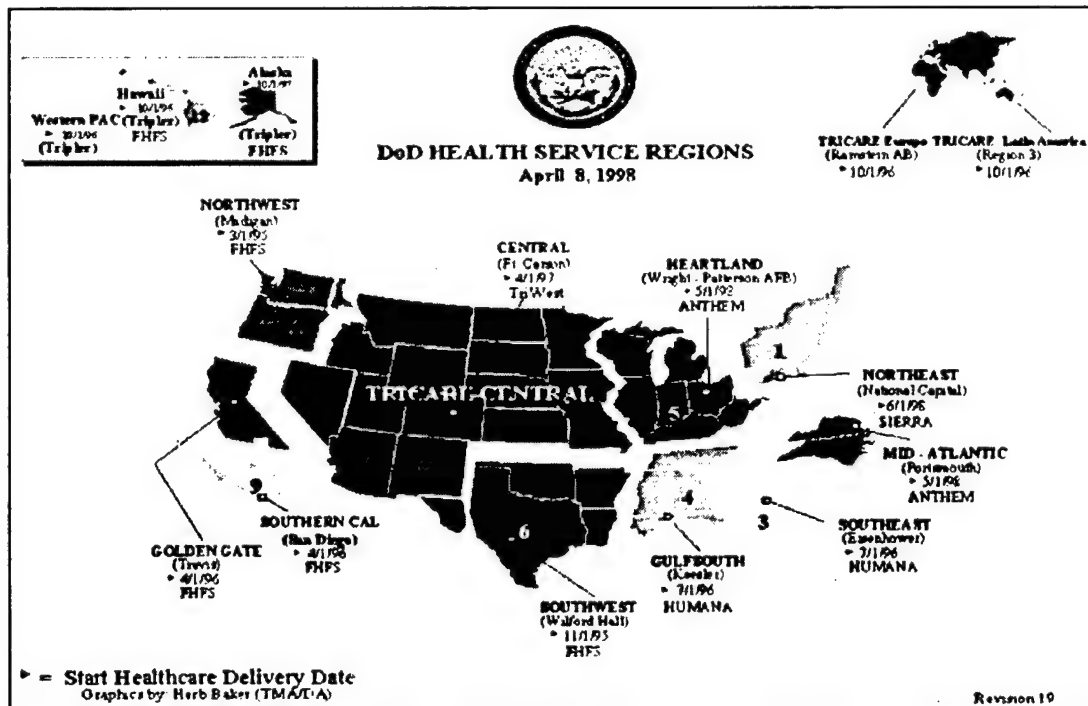


Figure (4): OSD(HA) Health Service Regions

Specific tasks for each business unit will include regional standardization, acquisition, procurement, distribution management for the region, and developing an integrated information management system to support initiatives and data analysis.

G. MAJOR BUSINESS PRACTICES

The Tri-service Medical Logistics major business practices are essential to establish successful regional business units. Eliminating excess inventory, improved procurement practices and patterns, and a maintenance strategy that analyzes life-cycle support costs and implements regional maintenance plans, are all strategies to

improve access to healthcare while lowering total delivery costs throughout DoD. Regional logistics is a must and implementation is essential if the MHS is to realize substantial cost savings. The Department of the Navy must take steps to maximize their involvement in all these following initiatives.

1. Standardization

To fully achieve the benefits of regional materials management, clinically driven standardization programs will need to reduce the medical products and equipment items procured by the MHS. Regional standardization could provide consolidated, region-wide data about pricing and consumption; clinicians could then select products based on quality, price, and usage patterns. Following standardization efforts, capitated supply contracts could be developed which could further increase cost savings through economies of scale. Standardizing pre-packed surgical supplies first would prove to be the best test of a regional standardization program. The topic of standardization will be further addressed in later chapters of this thesis.

2. Best Value Acquisition

Standardization is just the initial step to ensure DoD is buying the right product. Improving acquisition strategies to include regional capitated supply contracts will ensure DoD is paying the right price. Capitated

purchasing means that the military will negotiate a fixed price based on historical usage or per member per month formula for standardized products on a regional basis. Projecting surgical demand accurately will allow DoD to enter contracts with the confidence that demand will meet the range of volume promised in the contract.

3. Regional Maintenance Strategies

As with regional standardization across disposable medical supply lines, standardization along equipment lines shows promising returns, concentrates expertise and enhances relationships with vendors on a regional basis. Prior to standardizing equipment, military medicine must improve how it performs value analysis on a regional level. When selecting equipment on a regional basis, the following questions must be considered:¹³

1. Do physicians or healthcare providers need all of the features offered by a particular piece of equipment?
2. Are there better alternatives for its intended use?
3. Is there any excess supply that can be used to meet current demand vice purchasing more of the same equipment?
4. What disposable supplies are associated with the existing equipment? Are replacement supplies more expensive if the equipment is standardized to another manufacturer?
5. Does the equipment meet specifications for Deployable Medical equipment?
6. Will standardized equipment jeopardize overall mission readiness and deployability?

¹³ Ammer, D.S. (1989). Purchasing and Materials Management for Health-Care Institutions (2nd ed.). Lexington Books: Toronto.

Tomorrow's logisticians must lead the MHS's cost reduction efforts through standardization, integration, and smart business practices.¹⁴ OSD(HA) should quickly implement and consolidate regionally all medial logistics efforts into a single regional entity responsible for day-to-day operations at various MTFs. All the efforts to achieve cost reductions will not be intuitively obvious to some logisticians. Using improved value analysis, activity-based costing methodologies, and working closely with clinicians will provide the stepping-stones to success for military medical logistics in the next millennium.

H. OUTSOURCING

Outsourcing is here to stay. As evidenced, the Under Secretary of Defense for Acquisition and Technology stated the following at the Industrial College of the Armed Forces Privatization and Outsourcing Symposium:

Outsourcing is not a theory based on uncertain assumptions. Experience in DoD and the private sector consistently and unambiguously demonstrates how the competitive forces of outsourcing can generate cost savings and improve performance. One need only glimpse at the operations of our nations most successful companies to see the dramatic benefits that they realized through outsourcing and competition.¹⁵

¹⁴ Ibid.

¹⁵ Kaminski, P. G, (April 24, 1997). Defense Efficiencies and Outsourcing. Concluding Remarks of The Under Secretary of Defense for Acquisition and Technology. Crystal Geteway Marriott, Arlington, VA.

Since future OSD(HA) budgets are expected to decline, funding for modernization efforts will have to come from savings in support operations, such as depot maintenance, base services, and healthcare. These areas are viewed by some as ideal for outsourcing. The key is to outsource without compromising military readiness - do not outsource those functions that are inherently governmental or military in nature. Figure (5) below shows how the outsourcing pie was sliced in 1996.

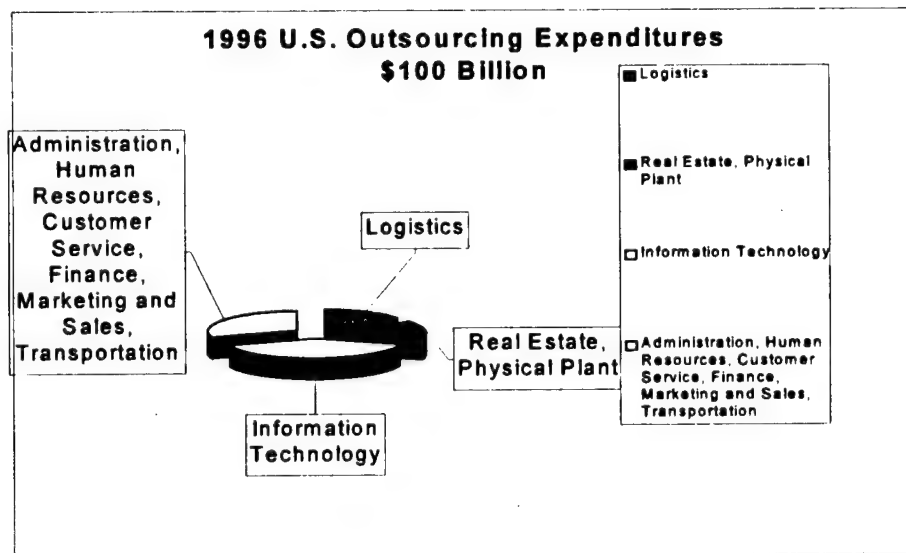


Figure (5): Outsourcing Expenditures¹⁶

Of all the current supply chain strategies, outsourcing is perhaps the fastest growing.¹⁷ McFaul (1996) says: "Many

¹⁶ Batts, B. (1998). Outsourcing Insight, Inc. The Future is not what it used to be.
[Http://www.cyberport.net/outsourcing/](http://www.cyberport.net/outsourcing/)

of the services and functions of hospital materials management will probably be outsourced in the near future."¹⁸ According to Morgan (1998), one claim for outsourcing that is in need of revision, or at least clarification, is that outsourcing results in reduced inventories. Roughly two-thirds of the time it does result in reduced inventories. On the other hand, nearly 20% of outsourcing results in higher inventory levels. Morgan (1998) goes on to say that companies that are 500 miles or greater away from their source of replenishment typically experience growth in their inventory levels.

1. Outsourcing advantages and disadvantages

There are many advantages to outsourcing. They include:

- ☐ To acquire expertise, talent, and resources that don't exist internal to the MTF.
- ☐ To let the MTF commander (and OSD(HA)) to focus and improve upon core competencies.
- ☐ To improve operations and customer service.
- ☐ To develop value-added capabilities to better serve the patient base and their requirements.

¹⁷ Morgan, J. (March 26, 1998). The Great Outsourcing Push. Purchasing.

¹⁸ McFaul, W. (1996). Is There Life After Outsourcing and Consolidation. Hospital Materials Management. Vol. 21, Number 11, pp. 16-17.

- ☐ To take advantage of new technologies which the third-party outsourcing agent is responsible for integrating into any agreement.

Not every decision to outsource is a good one. Outsourcing disadvantages and challenges are as numerous as it's advantages. Some of the disadvantages include:

- ☐ Perceived loss of control by the MTF commander or on-site logistician.
- ☐ Contract monitoring which can be a management nightmare.
- ☐ Jeopardizing mission readiness.
- ☐ Reduction of military logisticians resulting in fewer personnel familiar with operational logistics.
- ☐ Reduction of individual MTF yearly budgets.

Outsourcing is an option that exists when examining the future of medical logistics. A complete analysis of this alternative is beyond the scope of this thesis, but since the potential to outsource is real, the idea and some issues are given consideration.

2. Should OSD(HA) outsource all or part of their logistics functions?

After regionalizing its medical logistics, OSD(HA) should outsource their inventory management functions at the MTF level. As OSD(HA) consolidates regionally, tens of millions of dollars expended by the average hospital for supplies, capital equipment and purchased services will swell into hundreds of millions of dollars.

In an outsourcing arrangement, OSD(HA) would contract for services rather than employ them. This spares the expense of payroll and benefits and may offer OSD(HA) an opportunity to tap the efficiencies and expertise of a company with deeper ranging resources, in a package designed to improve bottom-line results. A true outsourcing strategy will bring together industry knowledge and information technology to create systems that will improve OSD(HA's) cost-efficiency and effectiveness while providing better patient care services.

There are certain conditions which, if they exist, make any organization within DoD ripe for outsourcing. They include:

- ☐ **Current in-house logistics information technology is outdated or does not integrate the entire supply chain.** Here, the motivation for outsourcing is to gain use of efficient, easy-to-use, state-of-the-art technology that is essential to attract and retain healthcare professionals, administrators, support personnel, and patients. Operations and Maintenance funds to procure and maintain new high-technology is lacking. Developing DoD-specific logistics management programs is slow. Partnering with a third-party logistics firm would give DoD access to not only knowledge resources but also the best Commercial off-the-shelf Technology (COTS).
- ☐ **Internal experts in logistics are not available.** DoD has a large staff of logisticians. But, integrating third-party logistics, capitalizing on external sources of savings, and reengineering logistics function is not typically their highest priority. They are usually busy with local procurement, personnel management issues, and day-to-day operations. This renders them ineffective at generating logistics strategies that transform the

MTF into a competitive institution by lowering costs and strengthening supply chain relationships. Outsourcing medical logistics functions would completely reengineer the way OSD(HA), and in particular the MTF commander, does business today.

- **New technology and procurement strategies are required to stay competitive.** In an era when budgets are shrinking and beneficiaries are growing, outsourcing logistic functions can bring revenues back into DoD MTFs. Third-party logistic organizations bring with them purchasing strategies that make them capable of tremendous savings. These savings, coupled with continuous improvements in technology, make outsourcing MTF logistic functions a real possibility.

OSD(HA) should consider outsourcing regional logistics functions once the Tri-Service Regional Medical Logistics Plan is implemented.

3. Outsourcing Questions

Understanding OSD(HA) medical logistics strategies and functions is crucial when developing an outsourcing strategy. Outsourcing should be undertaken only after an exhaustive organizational and operations analysis. This type of analysis is beyond the scope of this thesis. However, this thesis does consider outsourcing as an alternative solution to controlling costs after tri-service medical logistics are regionalized. When considering outsourcing all or part of medical logistics functions, DoD should reflect on and analyze the following questions:

- **What is OSD(HA's) current strategic objectives regarding services and costs?** DoD must determine

which logistics activities are driven by the need to keep costs down, and which are geared toward achieving strategic advantage or enhancing customer service. Capitalizing on a single logistic activity that has potential to reduce cost while improving customer service to DoD beneficiaries is where DoD should focus their investigation and efforts. It is imperative to determine the tradeoff between cost and service. Once that is complete, DoD can assess what level of outsourcing is required to meet that specific level of performance.

- ☐ **Which activities should be owned and which should be outsourced?** Using data gathered from the previous question, DoD should be able to examine the benefits of outsourcing different commodities. Here, the main assumption is to outsource those activities where cost is difficult to control, where third-party activities have more expertise, and where service can be improved. Logistic operations at MTFs is just one potential for outsourcing that meets this requirement.
- ☐ **Should owned resources be reconfigured?** Outsourcing has varying effects on remaining operations. Once a decision is made to outsource, one must decide the fate of the remaining operations and personnel. Where will they work? Does DoD downsize to meet the financial requirements of the contract with the third-party vendor? Who manages the day-to-day operations at the MTF? Serious questions exist that need to be identified and addressed before any outsourcing is attempted.

Why should OSD(HA) drain their labor pool doing jobs that the private sector can perform equally well or even better for less money? Why not shift non-mission critical work to commercial firms and free up resources to focus on core competencies vital to OSD(HA) objectives? Following regionalization, OSD(HA) should outsource all the inventory management functions at the MTF level. Inventory management

is not a core competency of OSD(HA). MTF commanders are in the business of caring for patients, not managing inventory. OSD(HA) has taken themselves out of the inventory management partially following the implementation of the medical/surgical and pharmaceutical regional Prime Vendors.

Outsourcing of key support functions, with the strong prospect of lowering costs and improving performance, should be OSD(HA's) top management reform initiative. Prior to the quadrennial review, the deputy secretary of defense established a comprehensive review of candidate outsourcing programs, focusing on logistics management and other commercial-like activities. Major acquisition reform initiatives have already improved efficiency and lowered overall logistics costs.

One major initiative established a simplified acquisition threshold of \$100,000. This means all purchases of \$100,000 or less involve less regulatory bureaucracy and, in the long run, less cost to the government. Secondly, DoD has initiated a robust campaign to encourage using the International Merchant Purchase Authorization Card (IMPAC). Using this credit card will dramatically reduce acquisition cycle time and paperwork associated with procurement actions. Finally, DoD has expended considerable effort regarding paperless acquisitioning. This initiative alone stands to revolutionize the way OSD(HA) conducts logistics

affairs. These initiatives enable OSD(HA) to outsource their medical logistics efforts at MTFs.

In conclusion, by contracting out work that DoD otherwise would do themselves, MTFs can save time and money while gaining flexibility to deal with future growth, decline, or modernization. New projects can be added without increasing employment or retraining workers and others can be scrapped without worrying about where to reassign workers. Again, according to the Under Secretary of Defense for Acquisition and Technology:

...outsourcing fosters better management focus. In recent years, our nations most successful companies have focused intensively on their core competencies – those activities that give them a competitive edge and outsourced support activities. The activities that have been outsourced remain important to success, but are not at the heart of an organizations mission. Business analysts frequently highlight the fact that the attention of an organization's leaders is a scarce resource that should be allocated wisely. This is equally true for the Department of Defense.¹⁹

I. CHAPTER SUMMARY

Regionalization of medical logistics is happening within DoD and has the potential to produce dramatic savings. Lowering overhead, eliminating or reducing Full Time Equivalents (FTEs), and reducing the warehousing footprint of most MTFs will empower regional medical logistics operations to act more efficiently. Joint Vision 2010 spells out the role of logistics in the future.

¹⁹ Ibid.

Focused and lean joint logistics will be the theme both on the battleground and at the MTF. A higher reliance on COTS technology, development of third-party logistics partners throughout OSD(HA), greater use of information technology in support of decisions, and outsourcing potential logistics functions will enable OSD(HA) to meet their share of Joint Vision 2010.

IV. DEMAND AND SUPPLY CONSIDERATIONS

A. SUPPLY CONSTRAINTS

Access to the physician, capital equipment, and operating rooms are the central factor limiting the production of surgical care throughout DoD. In the DoD, policy may be the primary element guiding and shaping the allocation of resources for surgical care. It appears that supply-side constraints shape the number of surgical procedures completed throughout DoD MTFs.

Defining the maximum units of surgical procedures (S) starts with a simple yet powerful example of supply and demand curves. This assumes that population demographics determines the total number of surgical cases demanded in a catchment area. The supply of surgical cases (S_s) is inelastic; controlled by OSD(HA) policy regarding command billet authorization. Holding supply constant, any excess demand becomes a surgical case performed through a Tricare and/or Medicare provider in the local community. Therefore, any demand above the available supply (Q_0), is constrained by the MTFs mix of variable inputs (labor) and fixed inputs (capital). For example, using a Lagrangian optimization methodology, utility, or output (Y) can be determined by maximizing output subject to supply constraints.

$$\text{Maximize: } Y = X_1 + X_2 + X_n + \lambda_1 (K_1 + K_2 + K_n - K_{\text{bar}}) + \lambda_2 (L_1 + L_2 + L_n - L_{\text{bar}})$$

Y = maximum utility or the total number of surgical cases performed on a given population over a period of time.

X_1 = Specific surgical procedure (i.e., C-Sections) performed during that period.

X_n = The last surgical procedure performed during that period.

λ = The LaGrange multiplier. It represents an incremental change in the objective function for a small change in the binding constraint.

K = The quantity of capital to produce $X_1 + X_2 + X_n$.

L = The quantity of skilled labor to produce $X_1 + X_2 + X_n$.

The only way throughput can be increased is not by changing the population, but by changing the resource structure. Changing the ratio of physicians to equipment, constructing new operating rooms, or updating old equipment with new and quicker technology can change throughput efficiencies in the long run.

B. DEMAND FOR SURGICAL CASES

1. Assumptions

It is assumed that the demand for treatment at the MTF and Tricare facility are perfect substitutes. One is not typically preferred over the other. The quality of services offered by both facilities is equivalent. It is assumed

that there is a general level of services that both facilities are able to meet. An increase in demand (shift to the right) for care at the MTF will automatically result in a decrease in demand (shift to the left) for the Tricare organization. There is only a perceived difference in the value of care by the consumer.

2. Demand

Holding supply constant, what will be the change in demand for any incremental change in the population? Total demand can be written as:

$$U = D_{MTF} + D_{Tricare} + D_{Other}$$

Where:

U = Utility, or total demand

D_{MTF} = Demand for surgical procedures done at the Medical Treatment Facility during a given period of time.

$D_{Tricare}$ = Demand for surgical procedures done by a Tricare provider within the catchment area during a given period of time.

D_{Other} = Demand for surgical procedures done by any provider other than an MTF or Tricare provider within the catchment area during a given period of time.

Each individual's demand function can be determined using Lagrangian. Consumers maximize their utility subject to a budget constraint. Utility is assumed to be an increasing function of the quantity of goods consumed, but

marginal utility is assumed to decrease with consumption.²⁰ Demand within the MTF, the Tricare provider system, or other providers all come at a perceived cost to the beneficiary. This cost is the constraint which limits demand from the consumers' perspective. Determining the utility function for family members of active duty might look something like this:

$$\text{Maximize } U(X_{\text{MTF}}, Y_{\text{Tricare}})$$

subject to the constraint that a fixed amount of income is spent consuming healthcare within a given period of time:

$$P_X X_{\text{MTF}} + P_Y Y_{\text{Tricare}} = I$$

Here, X and Y are the quantities of the two goods that the Family Member demands; P_X and P_Y are the prices of the goods, and I is income. Rewriting the constraint and defining $U()$ as the consumer value for treatment from the two facilities, the Lagrangian then becomes:

$$\ell = U(X, Y) - \lambda (P_X X_{\text{MTF}} + P_Y Y_{\text{Tricare}} - I)$$

Differentiating ℓ with respect to X, Y, and λ , and then equating the derivatives to zero, we obtain the necessary conditions for a maximum:

$$MU_X(X, Y) - \lambda P_X = 0$$

$$MU_Y(X, Y) - \lambda P_Y = 0$$

²⁰ Pindyck, R. S., & Rubinfeld, D. L. (1997). Microeconomics (4th ed.). New Jersey: Prentice Hall.

$$P_X X_{MTF} + P_Y Y_{Tricare} - I = 0$$

Here, MU is short for marginal utility (i.e., $MU_X(X,Y) = \partial U(X,Y) / \partial X$, the change in utility from a small increase in the consumption of a good X). The three equations above can be solved to determine the unknowns X, Y, and λ as a function of the two prices and income. Substitution for λ then allows us to solve for the demand for each of the two goods in terms of income and the prices of the two commodities. A frequently used utility function is the Cobb-Douglas utility function which can be used to solve for the demand for surgical care under individual budget constraints. For example:

$$U(X,Y) = a \log(X) + (1-a) \log(Y)$$

To find the demand functions for X and Y, given the usual budget constraint, it is necessary to first rewrite the Lagrangian:

$$\ell = a \log(X) + (1-a) \log(Y) - \lambda (P_X X_{MTF} + P_Y Y_{Tricare} - I)$$

Now, differentiating with respect to X, Y, and λ , and setting the derivatives to zero, yields:

$$\partial \ell / \partial X = a/X - \lambda P_X = 0$$

$$\partial \ell / \partial Y = (1-a)/Y - \lambda P_Y = 0$$

$$\partial \ell / \partial \lambda = P_X X + P_Y Y - I = 0$$

The first two conditions imply that

$$P_x X = a/\lambda \text{ and}$$

$$P_y Y = (1-a)/\lambda$$

Combining these two conditions gives:

$$a/\lambda + (1-a)/\lambda - I = 0 \text{ or } \lambda = 1/I$$

If one were to substitute this expression for λ back into the previous equations to obtain the demand functions:

$$X = (a/P_x)I$$

$$Y = [(1-a)/P_y]I$$

The demand for each good depends only on the price of that good and on income, and not on the price of the other good. Therefore, depending on price, distance, and other non-financial constraints (opportunity costs), the level of surgical care provided is independent of the price for a substitute.

C. CHAPTER SUMMARY

This chapter outlined an economic supply and demand function analysis describing those relationships that exist at MTFs. Due to time and resources constraints, this thesis only includes data on a two-dimensional basis, which does not lend itself well to using linear regression analysis. Therefore, this thesis follows a simplified mathematical approach.

V. SIMPLIFIED MATHEMATICAL APPROACH

This chapter establishes a simplified mathematical model, which, if used properly, will yield a yearly surgical case load total DSCP can use to establish capitated contracting with manufacturers or distributors. Precise forecasts must be established to achieve cost savings. Accurately predicting demand and applying a contract to that demand is something with which OSD(HA) has had difficulty. Historically, DSCP has contacted commands and asked them to "guess" what their yearly demand will be. This model takes the guesswork out of it. Along with proposed standardization initiatives, this model should reduce contract volume variability and aid in developing Requests for Proposal.

A. ASSUMPTIONS

The percentage of a beneficiary category to total population was derived using calendar year 1998 demographics. Every other year was calculated based on calendar year 1998's beneficiary category percentages. Each beneficiary category was stratified by age category based on the reporting format in the NHCPs Managed Care computer system. The total incidence rate was determined using both NHCPs surgical cases along with those surgeries done by the managed care contractor. A weighted moving average was used

to determine calendar year 2000's incidence rate prior to using Crystal Ball®. Finally, incidence rates were developed for calendar year 1999 and 2000 using a 95% certainty level ($z=1.645$).

B. DATA ANALYSIS

The Managed Care Department provided population and surgical case data at the Naval Hospital, Camp Pendleton. Beneficiary categories consisted of:

- ☐ Active Duty (AD),
- ☐ Family Members of Active Duty (FMAD),
- ☐ Retired (RET),
- ☐ Family Members of Retired (FMRET),
- ☐ Survivors,
- ☐ Reservists, and
- ☐ Family Members of Reservists.

For this thesis, only Active Duty, Retired, and Family Members of Active Duty and Retired were used. Each beneficiary category was stratified to ages:

- ☐ 0-4,
- ☐ 5-14,
- ☐ 15-17,
- ☐ 18-24,

☐ 25-34,

☐ 45-64, and

☐ 65 and over.

Table (3) shows the breakdown of all beneficiary categories and their population totals.

FY98	
Total Population	
Active Duty	43298
Family of Active	44847
Retired	18905
Family of Retired	23065
Guard/Reserve	689
Family of Guard/Reserve	1081
Other	243
Survivor	4556
Totals:	136684

Table (3): FY98 Total Population

1. Population Structure

Figure (6) shows the population structure for the catchment area surrounding NHCP.

Population Structure

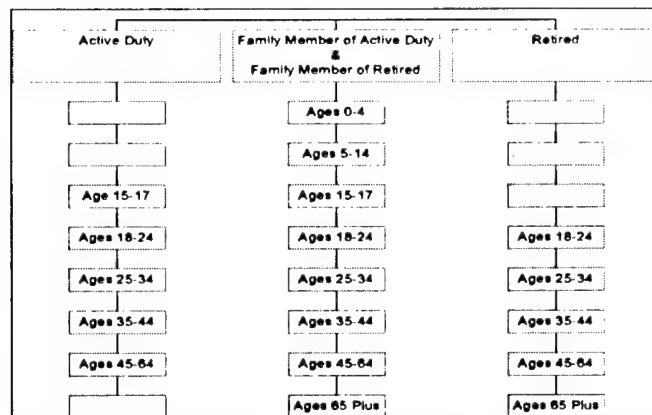


Figure (6): Population Structure

Each subordinate beneficiary category was broken down further to develop percentages per category in relation to their category total. Percentages for each age group within each category are illustrated in Table (4) below.

Ages	Active Duty	FMAD ¹	Retired	FMRET ²
00-04		24.10%		2.14%
05-14		28.66%		14.06%
15-17	0.13%	4.17%		7.44%
18-24	60.16%	15.05%	0.22%	10.44%
25-34	28.07%	17.60%	0.84%	1.72%
35-44	10.25%	8.18%	8.84%	8.61%
45-64	1.37%	1.92%	42.48%	31.07%
65+	0.92%	0.33%	47.62%	24.52%
¹ FMAD - Family Member, Active Duty				
² FMRET - Family Member, Retired				

Table (4): Beneficiary Percentages

2. Selected Surgical Cases

Overall, 12 surgical procedures were selected for analysis. These surgical cases were chosen based on discussions with the Director for Surgical Service at NHCP.²¹ The procedures are considered to be general cases performed by every MTF throughout DoD. They were:

1. Anterior Cruciate Ligament Repairs (ACL)
2. Knee Arthroscopy
3. Appendectomy
4. Exploratory Laparoscopy
5. Hernia Repair
6. C-Section
7. Tonsillectomy
8. Adenoidectomy
9. Tonsillectomy and Adenoidectomy
10. P.E. Tubes (BMTT)
11. High Ligation Internal Spermatic Vein
12. Dilatation and Curettage

3. Incidence Rates

Once population percentages and surgical cases were identified, incidence rates per population category were calculated to predict future demand based on changes in the population. Totals per procedure for 1997 and 1998 were made available by the Operating Room at NHCP. This information was stratified by Active Duty, Family Member of Active Duty & Retired, and Retired beneficiaries. Each beneficiary population category was then stratified by age.

²¹ Tobiason, Captain, Medical Corps, U.S. Navy, Director of Surgical Services, Naval Hospital, Camp Pendleton. (June, 1998).

Active Duty	0-4	05-14	15-17	18-24	25-34	35-44	45-64	65+
ACL	0	0	0	37	30	7	0	0
Knee Scopes	0	0	0	113	62	52	10	0
Appendectomy	0	0	0	32	9	1	2	0
Ex-Lap	0	0	0	8	2	1	0	0
Hernia	0	0	0	58	37	22	5	0
C-Section	0	0	0	32	15	3	0	0
D&C	0	0	0	17	2	3	0	0
Tonsillectomy	0	0	0	59	15	5	1	0
Adenoidectomy	0	0	0	1	0	0	0	0
T&A	0	0	0	1	0	0	0	0
BMTT	0	0	0	0	0	0	0	0
HLISV	0	0	0	14	5	1	0	0
Totals:	0	0	0	372	177	95	18	0

Table (5): Active Duty Surgical Cases (1997)

Table (5) illustrates how the Active Duty population (1997) was broken out. The remaining beneficiary categories were stratified in exactly the same manner.

With surgical procedures stratified as in Table (5), the focus then became identifying population totals using the percentages in Table (4). For example, the percentage of beneficiaries between ages 15-17 for FMAD is 4.17% (Table 4). Multiplying this number by the total population for beneficiary category FMAD yields the population for Family Members of Active Duty between the ages of 15 and 17. Furthermore, this number was the denominator used to

determine incidence rates for the surgical cases listed above.

Stratified population totals and incidence rates for 1998 were derived using actual data. 1997 actual aggregate population and surgical case data was also obtained from the Managed Care Department at NHCP. Population percentages were based on 1998 data and it is assumed that the percentages remain constant for the purposes of this thesis. Table (6) shows incidence rates for the selected surgical procedures for the Active Duty population for 1997. Once developed for 1997 and 1998, these rates were normalized to a population of 100,000 in order to use Crystal Ball® effectively.

Age	Active Duty						65+
	05-14	15-17	18-24	25-34	35-44	45-64	
Population		59	27790	12965	4736	634	4
ACL	0	0	0.001331	0.002314	0.001478	0	0
Knee Scopes	0	0	0.004066	0.004782	0.01098	0.01577	0
Appendectomy	0	0	0.001151	0.000694	0.000211	0.003155	0
Ex-Lap	0	0	0.000288	0.000154	0.000211	0	0
Hernia	0	0	0.002087	0.002854	0.004645	0.007886	0
C-Section	0	0	0.001151	0.001157	0.000633	0	0
D&C	0	0	0.000612	0.000154	0.000633	0	0
Tonsillectomy	0	0	0.002123	0.001157	0.001056	0.001577	0
Adenoidectomy	0	0	0.000036	0	0	0	0
T&A	0	0	0.000036	0	0	0	0
BMTT	0	0	0	0	0	0	0
HLISV	0	0	0.000504	0.000386	0.000211	0	0

Table (6): Incidence Rates for Selected Surgical Procedures (1997)

Incidence rates were developed for Active Duty, Retired, and Family Members of Active Duty (FMAD) & Retired (FMRET) beneficiaries within the Naval Hospital, Camp Pendleton catchment area. Using these well-defined incidence rates, tables were constructed to forecast demand using Monte Carlo simulation.

4. Simulation and Forecasting

This thesis will briefly show how forecasting was completed using Monte Carlo simulation on each beneficiary group. For purposes of brevity, this thesis will discuss the forecasting results for two population groups, Active Duty ages 18-24 and Family Members of Active Duty ages 25-34, for calendar years 1999 and 2000. Monte Carlo simulation uses a computational process that applies random numbers to derive an outcome(s). Instead of having fixed inputs, probability distributions were assigned to all of the incident rates, generating a probability distribution for the output after running the simulation. Each incident rate was assumed to conform to a normal distribution with the mean equal to the actual incident rate and standard deviation equal to 10% of the mean ($\sigma=.10$). There were 10,000 simulations performed.

First, 1997 and 1998 incidence rates were summarized as shown in Table (7a & 7b) below. The 1999 column is an average between 1997 and 1998. Simulations were run

assuming these average values were the mean incident rate for 1999. 1999 simulation results for Hernia repairs on Active Duty ages 18-24 and C-Sections on Family Members (FMAD & FMRET) ages 25-34 are illustrated.

Active Duty	Ages 18-24		Forecast
	1997	1998	1999
ACL	133.1	57.6	95.35
Knee Scopes	406.6	241.8	324.2
Appendectomy	115.1	168.9	142
Ex-Lap	28.8	19.2	24
Hernia	208.7	291.7	250.2
C-Section	115.1	145.9	130.5
D&C	61.2	76.8	69
Tonsillectomy	212.3	245.7	229
Adenoidectomy	3.6	3.84	3.72
T&A	3.6	3.84	3.72
BMTT	0	0	0
HLISV	50.4	38.4	44.4

Table (7a) Active Duty (18-24)

FMAD	Ages 25-34		Forecast
	1997	1998	1999
ACL	35.5	60.3	47.9
Knee Scopes	70.9	96.5	83.7
Appendectomy	35.5	60.3	47.9
Ex-lap	70.9	36.2	53.55
Hernia	59.1	60.3	59.7
C-Section	839.1	820.2	829.65
D&C	342.7	301.5	322.1
Tonsillectomy	23.6	24.1	23.85
Adenoidectomy	11.8	12.1	11.95
T&A	0	0	0
BMTT	0	0	0
HLISV	0	0	0

Table (7b) FMAD (25-34)

Figure (7) displays the normal distribution curve for Hernia Repairs for the Active Duty population, ages 18-24 in 1999. This was generated by Crystal Ball® using 10,000 simulations. The confidence level is set at 95% ($z=1.645$). 1997 and 1998 actual incidence rates for hernia repairs among this population was 208.7 and 291.7, respectively. The 1999 forecasted normalized incident rate is 280. The per person incident rate is 0.0028.

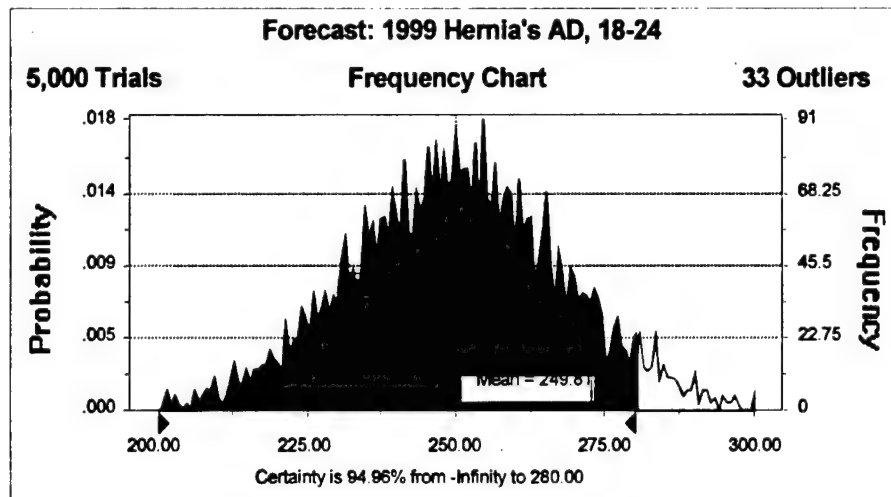


Figure (7): 1999 Forecast Hernia's

Figure (8) displays the normal distribution curve for C-Sections among the Family Members of Active Duty and Retired population, ages 25-34 for 1999. This was generated by Crystal Ball® using 10,000 simulations. Again, the confidence level is 95% ($z=1.645$). 1997 and 1998 actual incidence rates for this population were 839.1 and 820.2, respectively. The forecasted normalized incident rate is 924.17. The per person incident rate is 0.0092417.

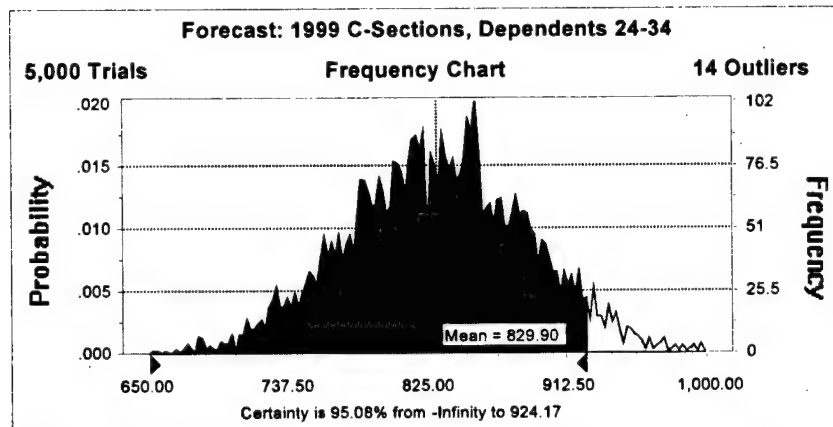


Figure (8): 1999 Forecast C-Section's

Using 1999's predicted incident rates, Tables (8a) and (8b) were constructed for each beneficiary category and surgical procedure. Assumptions were set for years 1997, 1998, and 1999 with 2000 being the forecasted year. Year 2000 was constructed using a weighted moving average of: $(1997 \cdot .15) + (1998 \cdot .25) + (1999 \cdot .6) = 2000$. This weighted moving average places significant emphasis on the most recent information. Since 1997 and 1998 were construction years, less relevance was given to how the forecast field was constructed. It was decided to give the forecast field of 1999 a simple average of 1997 and 1998. The forecast of 2000 is the main forecast for this thesis and therefore was given more consideration regarding forecast development.

Active Duty	18-24		Forecast	
	1997	1998	1999	2000
ACL	133.1	57.6	107.13	98.643
Knee Scopes	406.6	241.8	363	339.24
Appendectomy	115.1	168.9	159	154.89
Ex-Lap	28.8	19.2	28.73	26.358
Hernia	208.7	291.7	280	272.23
C-Section	115.1	145.9	145.67	141.142
D&C	61.2	76.8	77.09	74.634
Tonsillectomy	212.3	245.7	256	246.87
Adenoidectomy	3.6	3.84	4.15	3.99
T&A	3.6	3.84	4.17	4.002
BMTT	0	0	0	0
HLISV	50.4	38.4	49.53	46.878

Table (8a): 1999 Forecasts (Active Duty)

Dependents	25-34		Forecast	
	1997	1998	1999	2000
ACL	35.5	60.3	53.83	52.698
Knee Scopes	70.9	96.5	93.7	90.98
Appendectomy	35.5	60.3	53.77	52.662
Ex-lap	70.9	36.2	60.13	55.763
Hernia	59.1	60.3	66.75	63.99
C-Section	839.1	820.2	927.17	887.217
D&C	342.7	301.5	359.4	342.42
Tonsillectomy	23.6	24.1	28.63	26.743
Adenoidectomy	11.8	12.1	13.35	12.805
T&A	0	0	0	0
BMTT	0	0	0	0
HLISV	0	0	0	0

Table (8b): 1999 Forecasts (Dependents)

Figure (9) displays the normal distribution curve for Hernia Repairs among the Active Duty population ages 18-24 for the year 2000. This was generated by Crystal Ball® using 10,000 simulations. The confidence level is again 95% ($z=1.645$). For reference, actual incidence rates for 1997

and 1998 for this population group were 208.7 and 291.7, respectively. The 1999 forecasted incidence rate is 280. The forecasted 2000 normalized incidence rate is 302.5. The per person incidence rate is .00302.

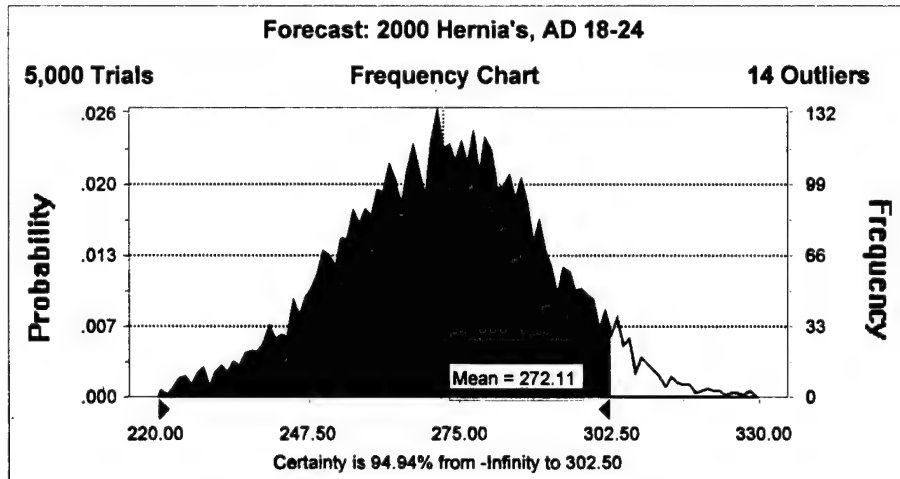


Figure (9):2000 Forecast Hernia's

Figure (10) displays the normal distribution curve for C-Sections for the Family Members of Active Duty and Retired ages 25-34 for the year 2000, which was generated by Crystal Ball® using 10,000 simulations. The confidence level is again 95% ($z=1.645$). The 1997 and 1998 actual incidence rates for this population were 839.1 and 820.2, respectively. The 1999 forecasted incidence rate is 927.17. The forecasted 2000 normalized incidence rate is 984.67. The per person incidence rate is .0098467.

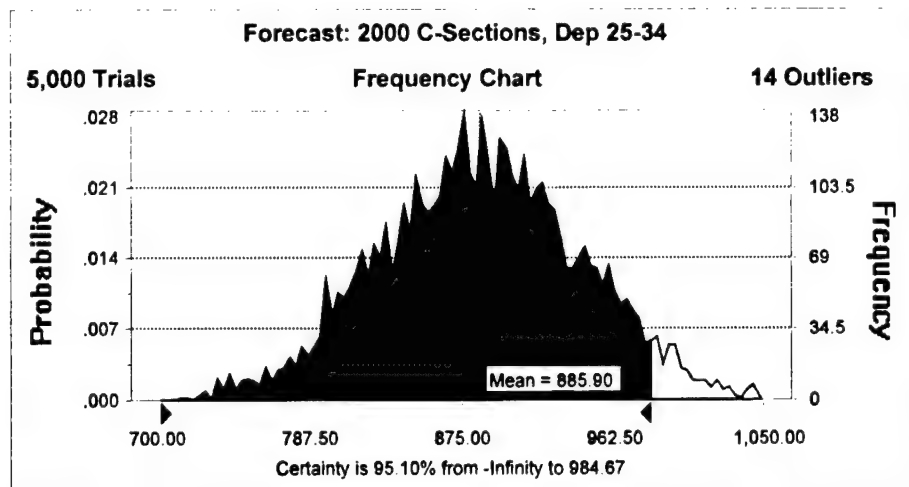


Figure (10): 2000 Forecast C-Section's

Simulations for 1999 and 2000 were performed for all surgical procedures and beneficiary categories.²² The 1999 and 2000 forecasted incidence rates were multiplied by projected population changes in Naval Hospital Camp Pendleton's catchment area, resulting in the total forecasted surgical demand stratified by beneficiary category, age, and procedure. Table (9) below includes projected surgical cases for calendar year 2000 on Active Duty personnel.

²² See Appendix "A" for completed simulations.

Active Duty								
Surgical Cases for CY 2000								
Age	0-4	05-14	15-17	18-24	25-34	35-44	45-64	65+
ACL	0	0	0	16	20	7	0	0
Knee Scopes	0	0	0	65	58	53	14	0
Appendectomy	0	0	0	45	10	2	2	0
Ex-Lap	0	0	0	5	2	1	0	0
Hernia	0	0	0	79	44	32	7	0
C-Section	0	0	0	39	17	3	0	0
D&C	0	0	0	21	5	3	0	0
Tonsillectomy	0	0	0	66	20	8	3	0
Adenoidectomy	0	0	0	1	0	0	0	0
T&A	0	0	0	1	0	0	0	0
BMTT	0	0	0	0	0	0	0	0
HLISV	0	0	0	14	5	2	0	0
Totals:	0	0	0	352	181	111	26	0

Table (9): Forecast Surgical Cases for
Active Duty (CY2000)

5. Chapter Summary

Using historical Operating Room and managed care data provided by NHCP, this thesis has developed a model to support surgical demand forecasting that can be used throughout DoD. Every MTF has access to this information. Furthermore, each MTF can now accurately predict future demand using incidence rates, adjusting for changes in catchment area population. Accurate forecasting adds value to mission awareness and defines the level of budgets required to support Operating Room functions.

Being able to better budget or plan for future case loads is only one advantage of the demand

forecasting procedure illustrated here. Standardizing nondurable surgical supplies and establishing efficient contracting mechanisms could generate significant savings in the future. The next chapter introduces the idea that a reduction in product variability offered at MTFs will reduce storage, handling, ordering, and processing costs. Costs associated with these logistic expense elements should further decline once MTFs transition to 100% pre-packed surgical trays (Custom Procedure Trays).

VI. STANDARDIZATION

This chapter defines product standardization as it relates to custom procedure trays. A continuum exists where surgical demand must first be determined, product standardization performed, and finally capitated contracting applied. This thesis has shown that surgical demand can be forecasted. This chapter shows how products can be standardized at the MTFs. The final step to cost reduction is to transition to capitated contracting for all custom surgical packs. Capitated contracting is difficult without a robust standardization program.

A. INTRODUCTION

Department of Defense Instruction 4120.3-M²³ states that all DoD activities shall:

standardize items used to the highest practicable degree by developing and using single specifications and standards, eliminating overlapping and duplicate specifications and standards, and reducing the number of sizes and kinds of items that are generally similar. Furthermore, management activities must identify and prioritize standardization opportunities that will contribute to such important DoD-wide objectives as reducing costs, improving performance, and accelerating delivery.

²³ DoD 4120.3-M Defense Standardization Program (DSP) Policy and Procedures. July, 1993.

In support of the OSD(HA)-wide standardization initiative, the Bureau of Medicine and Surgery (BUMED) has identified seven standardization objectives.²⁴ They are:

- ☐ Improve the operational readiness of the military services.
- ☐ Conserve money, manpower, time, facilities, and natural resources.
- ☐ Provide the best materiel, processes, and practices used in acquisition and logistics support.
- ☐ Enhance interchangeability, reliability, and maintainability of military equipment and supplies.
- ☐ Ensure that products requiring quality and minimum essential needs are specified and obtained.
- ☐ Ensure that specifications and standards are written to prescribe requirements to the particular need.
- ☐ Assure that specifications and standards imposed in acquisition programs are tailored to reflect only particular needs consistent with mission requirements.

BUMED realizes the financial rewards that come by implementing standardization programs. At the MTF level, product standardization is a challenge because there is no system-wide policy that establishes or defines product standardization committees, product evaluation criteria, or strategies that reduce or eliminate some products entirely. This is a problem in light of the current DoD culture. The Assistant Secretary of Defense, Health Affairs (ASDHA) is a

²⁴ BUMEDINST 4120.2 Procedures for Participation in the Defense Standardization and Specification Program (DSSP). March, 1992.

large organization that is highly fragmented and whose culture has had difficulty monitoring and supporting centralized initiatives.²⁵ ASDHA will find it difficult to realize the total savings possible through standardization because of the fragmentation that exists throughout the organizational structure.

This chapter will discuss a standardization strategy linking product demand to specific surgical procedures. It will outline a standardization committee approach - membership, products to review, and how to implement a nondurable product standardization program.

1. Total Cost Considerations

Seventy percent of supplies used to treat patients are consumed within the first few days of a patient's stay in the hospital. Traditionally, the operating room has been the point where most supplies are consumed. Figure (11) shows on-hand inventories consumed at average-size hospitals nationwide; an average of 48% are consumed by the operating room. Standardizing the nondurable products consumed by the operating room first will have the greatest impact in terms of immediate efficiencies and cost savings.

²⁵ Kissane, J. Colonel, U.S. Army. Director of Logistics, Walter Reed Army Medical Center. Interview. (23 Sept 1998).

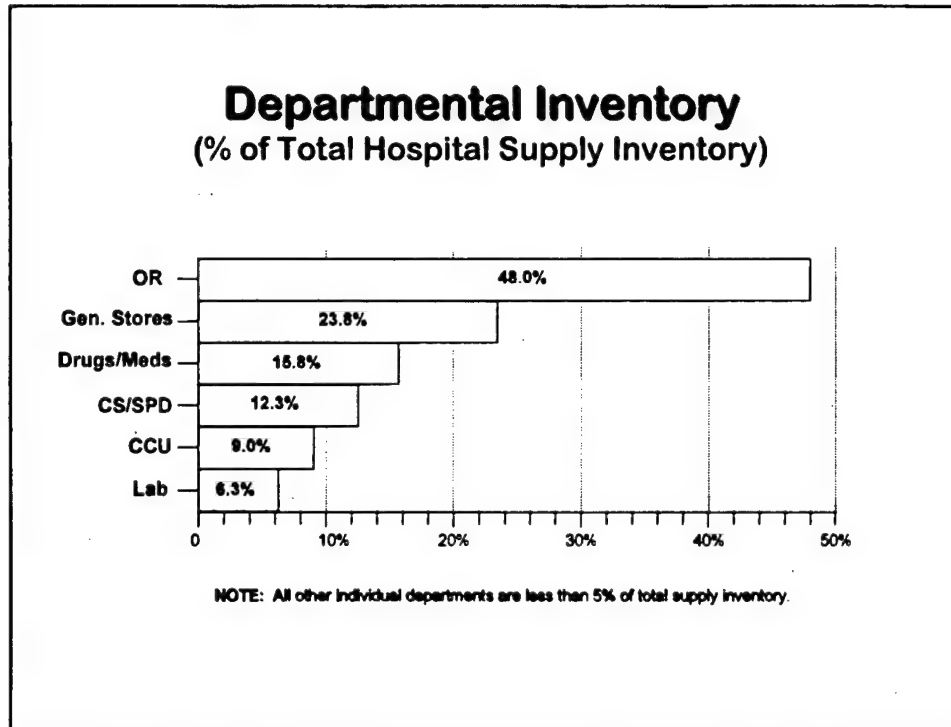


Figure (11): Departmental Inventory as a
Percent of Total Hospital Inventory²⁶

Concurrently, MTF commanders are being pressured to control and cut costs where possible. Discretionary spending is limited, and frequently comes by way of eliminating or deferring selected projects.

As an MTF commander, general operating expenses (OE) are equivalent to fixed costs. These operating expenses are long range fixed expenses that rarely change. Inventory is equivalent to variable costs and varies with the total number of beneficiaries being treated within a given period.

²⁶ Allegiance, Inc. Presentation. (24 Sept, 1998). Defense Supply Center, Philadelphia.

Real savings may be relatively difficult to capture by reducing operating expenses (labor, utilities, etc); they may be easier to capture by better managing nondurable inventories.

Total cost-to-inventory and cost-to-operating expenses can be viewed as two separate synchronous ratios:²⁷

1. $TC \div \text{Operating Expenses}$

2. $TC \div \text{Inventory}$

Equation one shows the relationship between total operating expenses and total cost. This relationship is fixed over a period of time, and the MTF commander should not look for efficiency gains or cost savings by using resources to trim current operating expenses.

Rather, the MTF commander should focus more on equation two. Here, the gains identified by the Healthcare Industry Study on Efficient Healthcare Consumer Response (EHCR) can be actualized immediately.²⁸ The MTF commander can become more efficient by reducing inventory through standardization and using smart purchasing procedures. This will free up additional discretionary funding which can be used to support education and training initiatives, purchase

²⁷ McMartin, S. (22 Sept, 1998). Interview. Isolyser Corporation, Vice President of Marketing and Sales.

²⁸ Ibid.

equipment wish-list items, or to fund requirements carried over from previous years.

According to the EHCR study, the cost-saving drivers include having the right product, in the right place, at the right time, in the most cost-efficient manner to serve the healthcare needs of the consumer.²⁹

B. STANDARDIZATION COMMITTEE ORGANIZATION

According to a 1993 survey of hospital material managers, nearly 88% said that their hospitals had a product standards and evaluation committee.³⁰ At the MTF, this function should be relegated to the Director of Surgical Services or the Director of Nursing Services. There should be an organization-wide Materials & Methods (M&M) committee with two functional subcommittees: one subcommittee to evaluate surgical product standardization and one to evaluate clinical product standardization. The organization-wide committee would evaluate products for standardization based on their usage throughout the MTF.

For example, the clinical services sub-committee, using physicians, nurses, and technicians from the various departments throughout the organization, would evaluate exam

²⁹ Ibid.

³⁰ Fitch, L. (June, 1993). Product Standardization and Evaluation Committee Survey. Journal of Healthcare Material Management.

gloves. On the other hand, the surgical sub-committee for standardization would evaluate surgical gloves, since the surgical directorate is the dominant user of surgical gloves throughout the organization. Either sub-committee could review products that serve a dual purpose with a confirmation signature by the chairman of the converse sub-committee.

Figure (12) illustrates the organizational structure that MTF commanders can adopt immediately. The Product Standardization Coordinator within this committee structure would serve as the organizational resource for product pricing, contracting implications for prime vendors and manufacturers, and would obtain non-sterile samples for review by the sub-committees. Since this approach is multidisciplinary, each sub-committee would be made up of several service specialties to include physicians, nurses, and technicians.

Every decision need not be a committee decision. For example, the selection of a standard sterile wrapper for use in the organization does not need to be made or influenced by a physician.

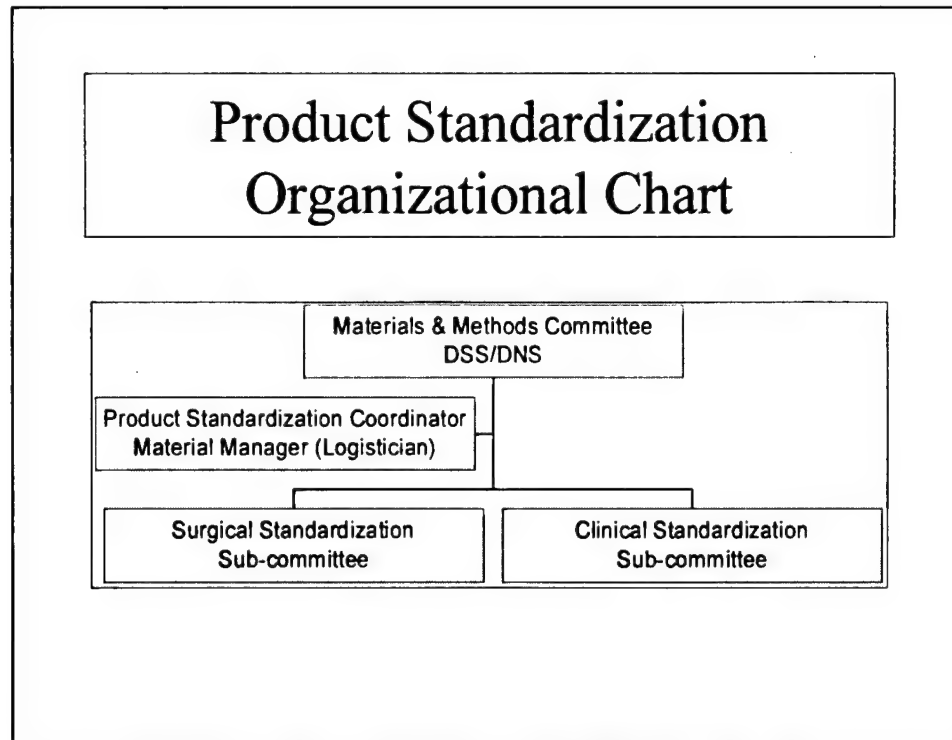


Figure (12): Product Standardization Organizational Chart

Nurses within the surgical committee can evaluate a group of wrappers for efficacy, cost, and performance and make the decision to standardize without committee involvement. Each product selection would be closely scrutinized by the Product Standardization Coordinator. Figure (13) illustrates the organizational structure of a proposed Surgical Standardization Sub-committee.

The typical surgical sub-committee could include:

Surgical Standardization Sub-committee

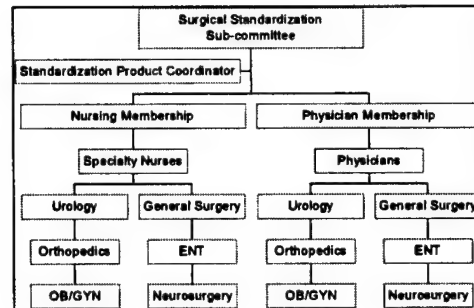


Figure (13): Surgical Standardization
Sub-committee

C. PRODUCT SELECTION PROCESS

1. What products should the MTF commander review first?

Successful implementation of any product standardization program involves breaking down product lines by:

- ☐ High-volume, low-tech, non-controversial product lines,
- ☐ Unique disposable products that are one-of-a-kind,
- ☐ Controversial items which are strictly physician preference.

Using ABC Analysis, MTFs should be able to identify high-volume inventory products that, if standardized, could provide substantial savings.³¹ ABC analysis is an inventory application of the Pareto principle.³² Vilfredo Pareto concluded that a large percentage of the total income was concentrated in the hands of a small percentage of the population in a proportion of roughly 80 percent to 20 percent, respectively. The general idea has found wide application and acceptance throughout business and inventory management practices.

Applying the Pareto principle to inventory management, the MTF commander should focus on those critical few (20%) items that account for a substantial portion of the cost (80% of total costs), not on the trivial many items (80%) that account for little of the cost. The critical few represent those items that will generate the largest resource savings.

More specifically, those items designated as class "A" could represent only about 15% of the total inventory, but as much as 70 to 80% of the total inventory investment. Class "B" items are those inventories of medium annual dollar volume. These items may represent about 30% of the

³¹ Heizer, J., and Render, B. (1996). Production and Operations Management. Prentice Hall, New Jersey. (4th ed.). p. 575-577.

³² Vilfredo Pareto, nineteenth-century Italian economist.

items and 15 to 25% of the total inventory investment. Those with low annual dollar volumes are class "C", which may represent only 5% of the annual dollar volume, but about 55% of the total inventory on hand. Figure (14) graphically depicts the impact of identifying products based on monthly sales (demand).

Product	Product Ranked by Demand	Monthly Demand (000s)	Cumulative Percent of Total Demand	Cumulative Percent of Total Items	An ABC Classifi- cation
Gloves	1	\$5,056.00	36.20%	7.10%	A
Suture	2	\$3,424.00	60.70%	14.30%	
Sponge 4x4 10s	3	\$1,052.00	68.30%	21.40%	B
H ₂ O Irrigation	4	\$893.00	74.60%	28.60%	
NaCL Irrigation	5	\$843.00	80.70%	35.70%	
Syringe 10cc	6	\$727.00	85.70%	42.60%	
Protective Masks	7	\$451.00	89.10%	50%	C
Knife Blade #10	8	\$412.00	91.90%	57.10%	
Knife Blade #15	9	\$214.00	93.60%	64.30%	
Grounding Pad	10	\$205.00	95.10%	71.40%	
Skin Stapler	11	\$188.00	96.40%	78.60%	
Light Handles	12	\$172.00	97.60%	85.70%	
Marlex Mesh	13	\$170.00	98.70%	92.90%	
Marking Pen	14	\$159.00	100%	100%	
Total Monthly Demand		\$13,966.00			

Figure (14): ABC Analysis Based on Sales

Demand data, indicating specific products and their usage over a fixed period of time, is available from the prime vendor (HPIS code).³³ The HPIS report includes two

³³ Kissane, J. Colonel, U.S. Army. Director of Logistics, Walter Reed Army Medical Center. Interview. (23 Sept 1998).

parts - one that reflects line item level of detail within each HPIS classification, and one that summarizes aggregate sales by HPIS and lists them in descending dollar value. This information should be used to establish procurement patterns, manufacturers most often used throughout a given period, product and catalog number, and order frequency patterns. Incorporating ABC analysis and results, the Materials and Methods Committee can develop a matrix to match products to surgical procedures.³⁴ The surgical procedures selected should include the major users of the products being reviewed. Figure (15) demonstrates a sample matrix for the Materials and Methods Committee.

³⁴ Ibid.

Product	Procedure								An ABC Classifi- cation
	AOL Repair	Arthroscopy	Appy	Ex-Lap	Hernia Repair	C-Section	T&A	EMTT	
Gloves									A
Sutures									
Sponges									B
H ₂ O Irrigation									
NaCl Irrigation									C
Syringe 10cc									
Protective Masks									
Knife Blade #10									
Knife Blade #15									
Grounding Pad									
Skin Stapler									
Light Handles									
Marlex Mesh									
Marking Pen									

Figure (15): Product Review Matrix

This is the starting point for product review and standardization. Knowing the key services that use the product will ensure that the right mix of physicians, nurses, and technicians make a standardization decision.

2. A Model for Product Review

It is essential to establish criteria to stratify inventory and products by demand and to develop a working matrix of services that consume those products. Without written criteria, evaluating the voluminous and continuous flow of new products can be an organizational nightmare. In order to avoid catastrophic failure of any standardization

initiative, this thesis proposes a product review model.

The model should include the following steps:

□ **1. Identify the Product or Product Line**

Using the aforementioned ABC analysis process, product identification should be fairly straightforward.³⁵

□ **2. Identify Product Specifications**

The product specifications in this model are the desired functions as identified by the user, not the manufacturer. Figure (14) plays an important role. The service user is identified and solicited for input regarding specifications.

□ **3. Develop Product Line Evaluation Criteria**

Efficacy, cost, durability, ease of use, vendor support, standard-of-care level of compliance, Joint Commission Accreditation on Healthcare Organizations (JCAHO) standards, clinical applicability, and infection control standards should comprise the evaluative criteria used for product reviews. Each product should be evaluated over a predetermined time period. Evaluation categories should be assigned a weighted number for evaluation purposes with the total points possible equal to 100.

□ **4. Collect Data According to Predetermined Product Line Evaluation Criteria**

Data are collected according to predetermined product evaluation criteria with the results compared to the set standards to measure actual performance.

□ **5. Data Analysis**

Review the strengths and weaknesses of each product within the product line.

□ **6. Product Selection**

³⁵ Ibid.

Based on the results of Step IV and Step V, product selection should be straightforward. The product selected should balance cost-effectiveness and the highest possible standard of patient care.

□ 7. Develop a Plan to Implement the Product

Once the product is selected, start purchasing the selected product and phase out the alternatives. This step is probably the most crucial and should not be rushed.

□ 8. Monitor for effectiveness

Product standardization is an ongoing iterative process. New and improved products are constantly entering the market and should be given the same consideration that existing products were given. This means that the Material and Methods Committee, nurses, physicians, and the Product Standardization Coordinator, must continually evaluate new products. Any new product that provides a better combination of cost-effectiveness and performance should be evaluated as a potential replacement for existing stock.

Figure (16) graphically represents each step in the product evaluation process. New product reviews would undergo the same evaluation process as initially performed on existing products.

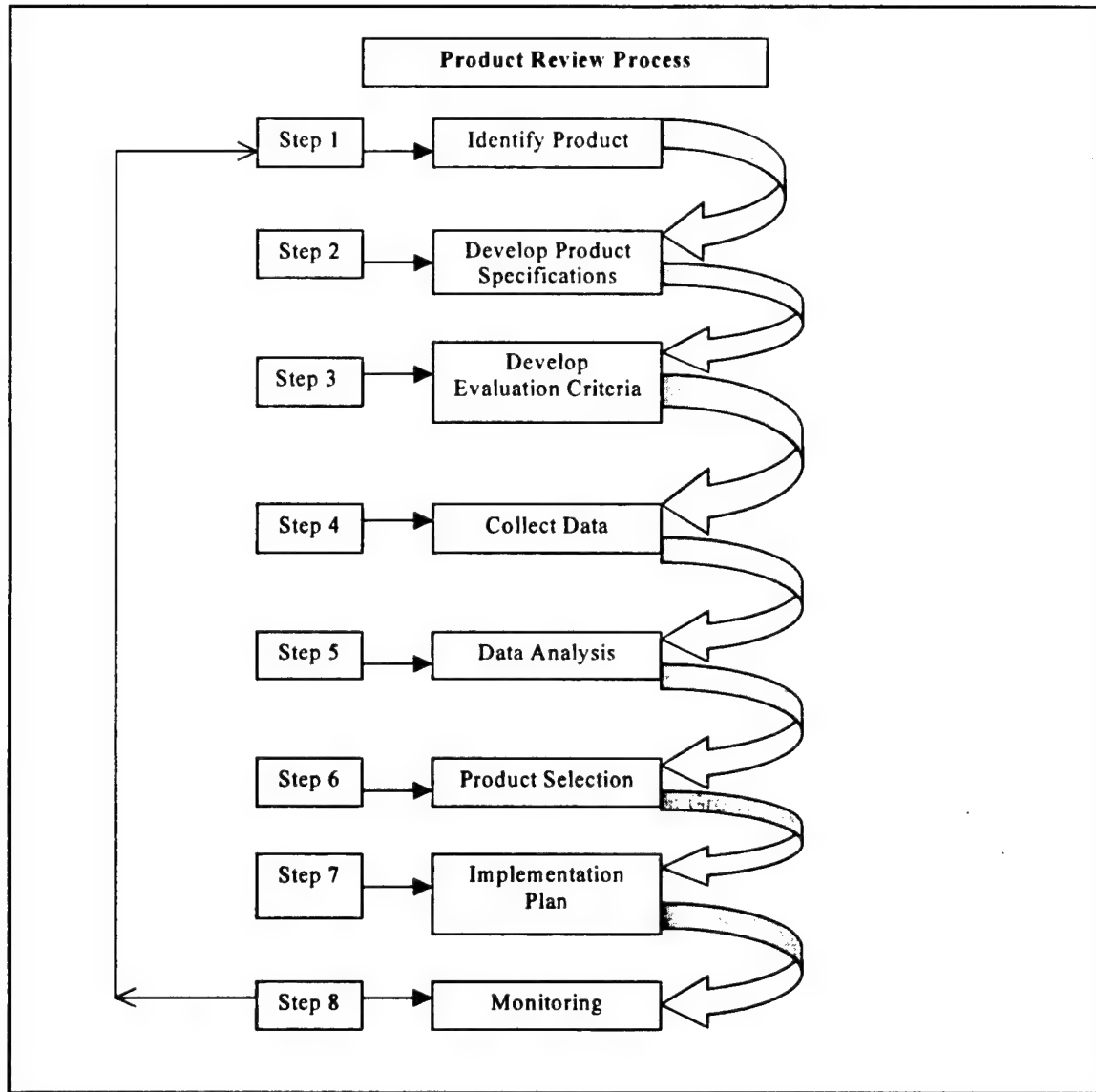


Figure (16) : Product Review Process

3. Standardization Pitfalls to Avoid

Just because standardization is seemingly logical does not automatically qualify it as universally desirable.³⁶ Therefore, product standardization cannot be considered independent of the people, context, or organizational policies surrounding it. Freed (1993) points out several pitfalls that should be avoided if any standardization initiative is to be successful. They are:

- ☐ A standardization policy that is too absolute or uncompromising in it's objectives.
- ☐ A standardization policy or program that is implemented too quickly.
- ☐ A standardization policy or program that is poorly defined and lacks focus.
- ☐ A standardization policy that is overwhelming in scale and is unmanageable.
- ☐ A standardization policy that is purely motivated by cost minimization or elimination.
- ☐ A standardization policy that is dictated rather than accepted.

Throughout MTFs, new programs are introduced with great expectations and often in response to long-standing deficiencies. Any radical approach to product standardization is doomed to fail if it strengthens and intensifies resistance within the professional community.

³⁶ Freed, D., H. (1993). Why Product Standardization Fails. Journal of healthcare Material Management. Vol. 11, Number 30. Pp. 34-35.

Physicians or nurses cannot be bullied into product standardization. Incremental change throughout the MTF, led by the Director of Surgical or Nursing services (DSS/DNS) serving as champion, stands the best chance of success. Initially, incremental change is much less threatening than a total systems overhaul. Unrealistic implementation schedules will effectively kill any standardization program. Support of the professional staff is won through easy victories where standardizing products is rather obvious. The logistician must help the professional staff understand the general concepts and practices of standardization during early program development.

The logistician and the DSS/DNS must clearly articulate a strategy to implement the standardization program. Simply put - "If you don't know where you're going, any road will get you there" has particular application with respect to product standardization. Linking delivery, cost, and manpower efficiencies to the standardization effort will improve the likelihood of program survival.

Cost avoidance and reduction are obvious Organization-wide benefits. Commonality of products and equipment throughout the MTF enables items to be moved around as required, which increases flexibility and productivity. These non-cost benefits help ensure that the right piece of equipment or the critically needed consumable supply is always available where needed. This outcome of

standardization must be overtly emphasized to clinicians and their staff when seeking their cooperation on standardization.

Even in the military, it is difficult to dictate standards to physicians and nurses. When market demands are high, professionals realize that their talents can easily be employed elsewhere. Standardization must be sold using hard data. Forced support of a mandatory program will only decrease morale and productivity, increase turnover in professionals, encourage unauthorized purchases using the IMPAC card and other efforts to circumvent the existing systems, and lose support for top leadership throughout the MTF. The best solution: present the standardization opportunities so they stand on their own merits without the appearance that they are being propped up the Commanding Officer or the Executive Steering Committee.

4. Standardizing Custom Procedure Trays (Prepacks)

DSCP has been tracking custom procedure tray demand and their yearly total costs to MTFs for over two years. Table (10) summarizes these annual costs for the tri-service MTFs within the National Capital Area (NCA)

North Atlantic Regional Medical Command - Standardization Results			
Cost Before Standardization			
DeWitt Army Hospital			
	Price	P/Month	Cost
Breast Biopsy	\$93.40	45	\$50,436.00
Hernia	\$94.58	45	\$51,073.20
Knee Arthroscopy	\$129.73	40	\$62,270.40
Fort Mead Kimbrough Army Hospital			
Arthroscopy	\$164.32	35	\$69,014.40
General Surgery	\$91.07	25	\$27,321.00
National Naval Medical Center (Bethesda)			
Knee Arthroscopy	\$145.42	22	\$38,390.88
Hernia Repair	\$74.41	40	\$35,716.80
Major Abdominal	\$108.72	30	\$39,139.20
General Purpose Pack	\$117.07	15	\$21,072.60
Andrews Air Force Base (Malcolm Grow)			
Knee Arthroscopy	\$149.46	15	\$26,902.80
Major Abdominal	\$109.83	20	\$26,359.20
Minor Abdominal	\$87.59	25	\$26,277.00
Keller Army Hospital (West Point)			
Minor General Surgery	\$91.85	18	\$19,839.60
Knee Arthroscopy	\$177.93	17	\$36,297.72

Table (10): North Atlantic Regional Medical Command
Standardization Results

prior to any centralized standardization effort. Prior to standardization, the NCA spent over \$530,000 annually to procure the pre-packed surgical material listed in Table (10). Table (11) is the same listing following a standardization program including the associated costs for

North Atlantic Regional Medical Command - Standardization Results

Cost After Standardization

DeWitt Army Hospital			
	Price	P/Month	Cost
Breast Biopsy	\$76.75	45	\$41,445.00
Hernia	\$76.75	45	\$41,445.00
Knee Arthroscopy	\$124.90	40	\$59,952.00
Fort Mead Kimbrough Army Hospital			
Arthroscopy	\$124.50	35	\$52,290.00
General Surgery	\$76.75	25	\$23,025.00
National Naval Medical Center (Bethesda)			
Knee Arthroscopy	\$124.90	22	\$32,973.60
Hernia Repair	\$76.75	40	\$36,840.00
Major Abdominal	\$105.35	30	\$37,926.00
General Purpose Pack	\$76.75	15	\$13,815.00
Andrews Air Force Base (Malcolm Grow)			
Knee Arthroscopy	\$124.90	15	\$22,482.00
Major Abdominal	\$105.35	20	\$25,284.00
Minor Abdominal	\$76.75	25	\$23,025.00
Keller Army Hospital (West Point)			
Minor General Surgery	\$76.75	18	\$16,578.00
Knee Arthroscopy	\$124.90	17	\$25,479.60

Table (11): North Atlantic Regional Medical Command
Standardization Results

those packages. The NCA saves over \$75,000 yearly as a result of their standardization initiative. To capture similar savings, every MTF throughout DoD should be looking for opportunities for cost-cutting standardization measures.

D. DAPA DISCUSSION, CURRENT DAPA HOLDERS AND THEIR CUSTOMERS

Currently, DSCP tracks the manufacturers and distributors that service various DoD and Veterans Affairs Medical Centers. As of September 2, 1998, DSCP had six manufacturers and distributors under DAPA (Medline, Allegiance, Clinipad, DeRoyal, MaxxiM, and Isolyser), 495 individual prepack configurations, and 44 pending prepack configurations. This effort involves 56 MTFs and an estimated annual sales of \$27 million. Table (12) shows the MTFs and VAs that Medline, Allegiance, and Clinipad

Custom Procedure Tray DAPA Holders and Their Customers		
Medline	Allegiance	Clinipad
Barksdale Air Force Base	Camp Pendleton Naval Hospital	National Institute of Health
Bermerton Naval Hospital	Brooke Army Medical Center	Portsmouth Naval Hospital
Charleston Naval Hospital	Fitzsimmons Army Medical Center	Walter Reed Army Medical Center
Fort Eustis	Fort Binning (Martin ACH)	
Fort Sill (Reynold ACH)	Fort Bliss (Wm Beaumont AMC)	
Nellis Air Force Base	Fort Gordon (Eisenhower AMC)	
Oak Harbor Naval Hospital	Fort Hood (Darnell AMC)	
Portsmouth Naval Hospital	Fort Irwin (Weed AH)	
Sheppard Naval Hospital	Great Lakes Naval Hospital	
	Madigan Army Medical Center	
	Lemoore Naval Hospital	
	San Diego Naval Hospital	
	VAMC Portland	
	VAMC Seattle	
	Walter Reed Army Medical Center	

Table (12): Custom Procedure Tray DAPA Holders

serve. Table (13) breaks down the MTFs and VA Hospitals that DeRoyal, MaxxiM, and Isolyser serve.

Custom Procedure Tray DAPA Holders and Their Customers		
DeRoyal	MaxxiM	Isolyser
Andrews AFB (Malcolm Grow)	Bermerton Naval Hospital	Beaufort Naval Hospital
Beaufort Naval Hospital	Brooke AMC	Camp LeJeune Naval Hospital
Brooke Army Medical Center	Camp LeJeune Naval Hospital	Fort Belvoir (DeWitt AH)
Camp Pendleton Naval Hospital	Fitzsimmons AMC	Fort Bragg (Womack AH)
Charleston Naval Hospital	Gort Gordon AMC	For Campbell (Blanchfield AH)
Ellsworth Air Force Hospital	Fort Polk (Baynes-Jones ACH)	Fort Gordon (Eisenhower AH)
Fort Belvoir (DeWitt ACH)	Fort Riley AMC	Fort Meade (Kimbrough AH)
Fort Bliss (Wm Beaumont AMC)	Fort Sill AMC	Great Lakes Naval Hospital
Fort Dix (Walson Army Hospital)	Grand Forks	Jacksonville Naval Hospital
Fort Eustis (McDonald AH)	Luke Air Force Base	National Institutes of Health
Fort Meade (Kimbrough ACH)	McClellan Air Force Base	National Naval Medical Center
Fort Monmouth (Patterson ACH)	Nellis Air Force Base	Portsmouth Naval Hospital
Great Lakes Naval Hospital	San Diego Naval Hospital	San Diego Naval Hospital
Heidelberg Army Hospital	Scott Air Force Base	SERMC
Hill Airforce Base	U.S. Air Force Academy	U.S. Air Force Academy
Keesler Air Force Base	Wilford Hall	U.S. Naval Hospital, Rota
Keller Army Hospital (West Point)	Wright Patterson	VAMC Indianapolis
Landstuhl Regional Medical Center		Warren Air Force Base
Nellis Air Force Base		Walter Reed Army Medical Center
National Naval Medical Center		
Portsmouth Naval Hospital		
VA Wilkes-Barre		

Table (13): Custom Procedure Tray DAPA Holders

Some MTFs use multiple companies to meet their current demand while others have selected a single vendor. Furthermore, using the prepack that DSCP provides allows the customer some flexibility. For instance, the MTF can decide the manufacturer, the component configuration by brand, location in pack by order of use, and the quantity needed per procedure.

This thesis chapter involves taking this initiative to the next generation: standardizing to a single pack

throughout the facility and region. The MTFs in tables (12) and (13) do not act as a regional purchasing consortium nor do they standardize their products throughout the MTF to capture economies of scale. The DAPA simply establishes pricing and the right for any Prime Vendor, DSCPs Mail Order Pharmacy or National Mail Order Pharmacy/National Pharmaceutical Wholesaler awardee to distribute an agreement holder's products to the government's participating medical activities and beneficiaries.

An individual DAPA and the item contained therein can be either national or regional in scope; it cannot be both. National distribution and pricing is preferred. DAPA applicants may choose to offer products on a regional basis if economic or business process constraints prohibit national pricing or distribution. Applications for regional DAPAs may be rejected for two reasons: if they restrict Prime Vendor distributors' or customers' access to either a product or to fair and reasonable prices; or if they prevent free and open competition among program participants.

E. WASTE MANAGEMENT

Healthcare is unique in creating a wide range of wastes, including: infectious biomedical waste (commonly referred to as "red-bag waste"); pathological waste; radioactive waste; expired pharmaceuticals; ultra-toxic waste (chemotherapy chemicals); and the hazardous waste more

common in industrial applications. At the heart of the custom pack debate is waste management. Redesigning and repackaging products to save money but degrading the environment is not smart business. Before prepacks were implemented, disposable items required during surgery were pulled off the shelf in individual peel packs. Although very labor intensive and time consuming, this method does reduce the unused disposable surgical items.

Several companies throughout the prepack industry offer sensible solutions to the waste issues. Instead of bundling each disposable item into a single easy-to-open kit, one alternative is to deliver all the required disposable items in a covered container. Whatever is not used during the case is promptly restocked back at the vendors facility that same day. This method has two obvious advantages: the facility can lower their total costs by returning unused supplies to the vendor; and, the hospital has less biohazardous waste to incinerate or haul off to a third-party waste management facility.

Another alternative is degradable surgical supplies. Specifically, Isolyser, Inc. has developed ORex® degradables (gowns, drapes, wound towels, etc.) which are degradable after washing at high temperatures. Isolyser claims a \$300,000 cost savings if the average-sized MTF

integrates this product into their prepacks.³⁷ Standardizing to ORex® surgical drapes, gowns, and wound towels will reduce the total output of biohazardous waste at any MTF, reduce the likelihood of contact by support personnel, and reduce the Navy's total cost for biohazardous waste management.

Waste management is a key driver in determining the final configuration of any prepack. If physicians use what is in the pack, without generating any additional waste, then the MTF has successfully configured the pack to meet the patient's and physician's needs. If, on the other hand, there are wasted disposable supplies, then proactive and ongoing configuration management should attempt to increase disposable supply utilization rates.

F. CONFIGURATION MANAGEMENT

Configuration management applies sound business practices to manage the configuration of defense materiel items, their defining technical data, and supporting data files. It involves interaction among government and contractor program functions, including design engineers, logistics, contracting, and manufacturing, functioning as a partnership to ensure that the government receives the best possible prepack design at the right cost. Configuration

³⁷ McMartin, S. (1998). Isolyser, Incorporated. Personal Interview.

management is a process for establishing and maintaining the consistency, design and physical attributes of the prepack surgical pack.

Financial savings accrue by accurately quantifying surgical demand, standardizing disposable surgical supplies in the prepack surgical kit, and then using capitated contracting to maximize the governments savings. Savings from standardization and contracting could be lost without a central authority to monitor prepacks design and change proposals. DSCP should be the central authority that can make final adjustments to any MTF prepack surgical kit. The standardization committee at each MTF must review potential changes to consider new products and their unit-cost impact on the prepack kit design. The committee would submit a change proposal to DSCP to integrate the new product into the prepack surgical kit.

Standardization committees, physicians, nurses, and technicians working with the prepack must ensure that the vendor doesn't substitute disposable supplies in the prepack. This practice, common throughout commercial industry, must be minimized for the standardization program and capitated supply contracting initiative to remain effective. Substitutions, if left unchallenged, could increase total cost, reducing the savings realized through the standardization program.

1. Product Structure

Product structure identifies the internal structure of the prepack surgical kit. This step of configuration management must be determined before any pack goes to production. Two packaging methods can be used. First, the items can be delivered in peel-packs that are consolidated for the particular case in a protective container. Each item would be opened as required by the surgeon. The unnecessary items remain in the protective container and are returned to the vendor at the end of the workday.

The other alternative is to consolidate all the non-sterile disposable items into a single "kit." The basic structure of the kit is predetermined before assembly and seldom changes. Items are selected for position within the pack based on their order of use. Figure (17) illustrates the various levels within a basic prepack.

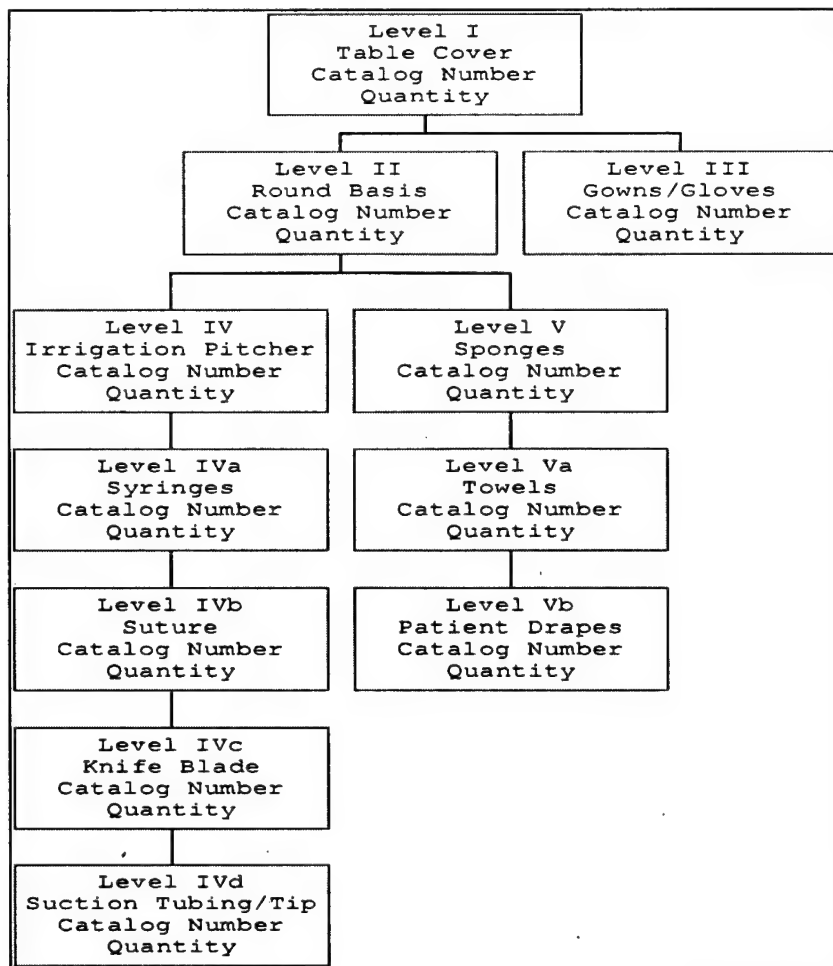


Figure (17): Prepack Levels

Level "I" is the outer wrapper that is also used as the back-table cover during surgery. At level "II" the round basis is inserted on top of the back-table wrapper. Level "III" can be placed alongside the pitcher or placed over the other disposable items inside the round basin. Level "IV" (Irrigation Pitcher) is placed inside the round basin and contains individual subordinate consumables (syringes, suture, knife blades, and suction tubing). Lastly, level "V" components are placed around the irrigation pitcher

inside the basin. The level "I" wrapper is used to close the pack. The manufacturer/distributor seals the completed pack inside a peel-pack container for sterilization and delivery. All levels provide an item description, manufacturer/distributor catalog number, and the quantities of each item included in the pack.

G. CHAPTER SUMMARY

This chapter outlined a product standardization process that DoD can adopt to reduce variability within the MTF stocked inventory. Using the demand simulation developed in the earlier chapters in conjunction with standardization initiatives, DoD should be able to enter into capitated contracting for specific numbers of prepacked surgical supplies. Establishing a successful standardization program relies heavily on identifying an organizational champion, achieving incremental successes, and making the best product selections based on operational needs and quality of care standards.

VII. CAPITATED SUPPLY CONTRACTING

A. INTRODUCTION

Capitation is an agreement between two parties on a fixed fee for a product or service. The item or service is delivered for this price regardless of the actual cost. DoD and contractors assume a certain amount of risk when entering into capitated supply contracts. Here, DoD and a supplier assume a portion of the financial risk and/or reward for a product or service. Therefore, capitated supply agreements could be higher-risk, higher-reward ventures that provide an opportunity to both make or lose large sums of money. OSD(HA) is at the heart of this capitated movement. OSD(HA) is capitating MTF budgets based on covered lives; it should progress to capitated supply contracting for procuring a portion or all supply requirements.

Capitation is just one alternative to lower overall system costs. Certain characteristics are critical to the success of capitated supply contracts. Open communication with vendors, suppliers, and providers; trustworthiness; a willingness to commit; a keen understanding of market

conditions; and limitations on both parties are necessary to ensure success.³⁸

B. MTF ENROLLMENT BASED CAPITATION

Under capitation, the commander of each MTF assumes responsibility for providing health services to a defined population for a fixed amount per beneficiary regardless of the health services used. There is no financial incentive under a capitation methodology to inappropriately increase services, or to provide more costly care than is clinically appropriate. This ensures that the MTF commander provides the most cost-effective treatment for each healthcare episode. A modified capitation model, developed by representatives from OASD(HA) and the military departments, is a population-driven methodology that accounts for unique military, medical-related functions. Enrollment Based Capitation (EBC) is broken down into three major levels:

- ☐ **Level 1: Military Medical Support.** This level is composed of non-capitated functions including readiness which are not directly related to the size of the force structure for which the MTF commander is responsible.
- ☐ **Level 2: Military Medical Unique Capitation Rate.** This is an additive rate to the basic capitation rate found in level one. It reflects the cost of military medical unique functions and a portion of medical readiness related to the size of the force

³⁸ Kowalski, J. (1997). Controlling supply expense through capitated supply contracting. Healthcare Financial Management. Westchester. Vol 51, Number 7. 74-79.

structure for which the MTF commander is responsible.

- **Level 3: Medical Capitated Costs.** This rate is analogous to the capitation rate used in civilian Health Maintenance Organizations (HMO) and would be similar to medical rates charged by competing health plans under a national health plan. This level includes all costs associated with providing patient care other than specific unique requirements for active duty members and military mission included in the first and second level.

The capitation rate is set based on the number of enrollees within a specific catchment area and is adjusted based on forecasted population changes. The capitation rate differs from one MTF to another. EBC is expected to be phased in starting the first quarter, fiscal year 1999.

C. FLOW OF FUNDING

Currently, the Lead Agent for a particular Tricare region has oversight responsibility for the managed care support contract. Following regionalization, OSD(HA) should channel all MTF funding for healthcare through the Lead Agent. The Lead Agent would pass funding to the MTFs based on their catchment area population totals. Each covered life would be worth a specific dollar amount. For example, an MTF commander at NHCP might receive \$700.00 per covered beneficiary per year, whereas the MTF commander at the Naval Hospital, Portsmouth, Virginia might receive \$685.00 per covered beneficiary per year within their catchment area. The capitation rate is different depending on the cost of

healthcare supplies and services within a particular region of the United States. Total annual MTF funding is a product of the capitation rate and the number of enrollees within a specific catchment area.

D. CAPITATING SUPPLY

Under capitated funding, MTF commanders receive funding on a per patient per year basis. For example, if an MTF commander has 125,000 beneficiaries within the MTF catchment area and the regional capitation rate is \$700.00, the MTF commander should be funded at \$87.5 million dollars for that fiscal year. As a rule of thumb, private sector consulting firms estimate that 40% of a healthcare system's costs are logistical.³⁹ Of the logistics costs, 50% can be traced directly to materials, biomedical maintenance, and facilities management.⁴⁰ Assuming that 20% is strictly nondurable supply, the dollar value of supplies required by the MTF commander is \$3.5 million. Figure (18) shows the annual MTF funding formula for supplies.

³⁹ Ibid.

⁴⁰ Ibid.

MTF ANNUAL FUNDING FORMULA FOR SUPPLIES		
1. Population =	125,000	
2. Capitation Rate =	<u>\$700</u>	
	\$87.5 million	
3. Logistics Costs =	<u>40%</u>	
	\$35 million	
4. Materials, Maintenance, Facilities =	<u>50%</u>	
	\$17.5 million	
5. Supplies =	<u>20%</u>	
	\$3.5 million	

Figure (18): MTF Annual Funding Formula for Supplies

For reasons discussed below, it would be difficult to administer and meet the requirements of a capitated contract for all \$3.5 million in disposable supplies.

Therefore, a logical assertion is that OSD(HA) can determine what percent of the capitated dollars constitutes disposable surgical supplies. This thesis assumes that 17% of the total disposable supply budget is consumed by the Operating Room in support of surgical cases. Consequently, of the \$3.5 million in disposable supplies, \$595,000.00 could be allotted to cover the annual costs of capitated surgical supplies.

Using the simplified mathematical approach defined earlier in this thesis, MTF commanders can accurately

forecast surgical demand. With an accurate regional forecast, DSCP should aggregate the surgical cases by Diagnostic Related Groups (DRG) and contract with a vendor to provide supplies at an annual fixed amount per DRG. Up-front, periodic, or incremental payments would be up to the Procuring Contracting Officer (PCO).

Right now, MTF commanders have considerable discretion over how the organization's Total Obligation Authority (TOA) is spent. The only fixed part of the TOA is civilian personnel expenses and utilities. With DSCP managing and funding the capitated supply contracts, MTF commanders should no longer be "passed" those annual dollars that were previously obligated to cover the costs of disposable surgical supplies. Those funds should be transferred under DSCPs to support the capitated supply contracts.

E. PRICE AND POPULATION ADJUSTMENTS

1. Price

The overall objective of using capitated supply contracting is to incentivize the supplier to find cheaper alternatives to existing inventory without jeopardizing quality or surgical outcomes. This is accomplished by establishing a fixed-price (per beneficiary, per year) incentive contract. Both upward and downward unit price adjustments are very important to monitor. Changes in the cost of individual item might not seem significant. It is

the cumulative affect that could result in a contract that is more expensive then initially expected. Therefore, when the cost of disposable surgical supplies exceeds the annual value of the capitated contract, OSD(HA) and the supplier should share in the loss. Likewise, when the supplier can lower the overall cost of care, it should be rewarded for finding cheaper alternatives. Determining the level of responsibility to be shared by OSD(HA) and the supplier is beyond the scope of this thesis.

2. Population

Dramatic increases or decreases in the catchment area population can affect the annual cost of a capitated contract. A mechanism should be developed to increase or decrease annual contract funding for sudden or unexpected changes in the population. Without accurate planning figures, any level-of-service determination made during the Request for Proposal will likely be inaccurate and misleading.

Annual review of forecasted changes in catchment area populaitons should be an integral part of the capitated supply contract strategy developed between the vendor and the MTF. A firm, fixed-price contract that doesn't consider changes in the demographics would result in considerable cost overruns or underruns and multiple layers of inefficiencies. However, a fixed-price, incentive type

contract that adjusts annually for population and price changes enables the vendor and DoD to make annual financial adjustments which reduces the risk associate with the capitated supply contract.

Capitating supplies should be a natural result of OSD(HA's) initiative to capitate MTFs. Using the surgical demand forecasting process developed earlier in this thesis, OSD(HA) should be able to capitate suppliers to reduce overall operating expenses. Accurate demand patterns and robust standardization programs are critical elements behind any successful capitated supply contracting strategy.

F. ELEMENTS OF RISK

1. Price Risk

This risk is due to the supplier not charging enough for a group of products. DoD should demand price reductions for every product imaginable. But, vendors must price their products reasonably to stay competitive in the market. This type of contract requires that DoD and the contractor take advantage of price breaks to generate savings.

2. Actuarial Risk

Problems will arise if actuarial projections on MTF catchment population projections are flawed. Disasters, mobilizations, large-scale military involvements, changes in unit cost, inflation, and introduction of new cost-efficient technology could contribute to higher than anticipated

contract costs. Accurate population and demand calculations will eventually determine the success or demise of any capitated supply contract.

3. Partner Risk

In this category, the preponderance of the risk is on the supplier. BUMED and the MTF commanders can alter the level of service provided by modifying physician staffing patterns. This could potentially alter the output of a particular specialty. They could also decide to invest in new capital equipment which could expand the level of services offered at the MTF. Other internal and higher authority policy decisions could potentially alter the level of service offered and therefore increase or decrease the value of the capitated contract to the supplier.

Equally important is the relationship that exists between the managed care contractor and the MTF commander. If services once provided by the community under the auspices of the Tricare program become unavailable and no other options exist, then the MTF commander could be forced to offer the service internally. Sudden changes in services offered by the managed care contractor can affect service required under a capitated supply contractor.

4. Utilization Risk

Limitations on product variability are essential especially in a new contract. In the beginning, it is best

to capitate those supplies that are associated with routine, every day surgical procedures and have predictable demand patterns. Eliminating "high-cost," non-recurring items from the contract should reduce this risk. It is important to know utilization patterns: how much is being used, and the large demand points within the hospital. The vendor should develop closer relationships with the cognizant departments to identify cost-saving techniques that are beneficial to both the vendor and the MTF.

G. TYPES OF CAPITATED SUPPLY CONTRACTS

1. Bill of Material

This involves establishing a cost per diagnosis related group (DRG). The price would be determined by both DoD and the potential vendor. It is imperative that DoD have complete and accurate cost data to support their cost per admission and outpatient encounter.

2. Product Line

Here, the vendor provides a specific product line (prepack surgical kit) at a capped cost based on a standard such as adjusted patient day. Again, OSD(HA) must provide the vendor complete and accurate cost data per DRG. Without accurate cost data, the vendor or DoD enter the contract without completely understanding the financial implications.

3. Total Supplies

In this option, the MTF chooses a primary vendor to provide as many products as possible, with a capped cost set at a base standard. It is possible for DoD to have a mixture of contracts simultaneously functioning within the MTF based on the needs of the specific department. After standardizing nondurable surgical supplies and constructing prepack surgical kits, it is possible for DoD to enter into a capitated product line contract with a vendor to cap (and reduce) expenses for the operating room.

Conversely, inpatient medical and surgical wards might be best served with a total capitated supply contract where more choice is available to meet numerous DRGs. Either way, the main idea is to cap and reduce operating expenses by sharing risk.

This thesis asserts that the product line capitated contract which establishes a firm, fixed-price (per beneficiary, per year) with a financial incentive reward is the optimal contract for OSD(HA) to implement. With the population and capitation rate defined, the government and the vendor negotiate an annual target cost. If the vendor delivers the annual requirements under the target cost, the vendor and the government would share in the savings. Likewise, any cost overruns would be shared by both parties.

The exact government-to-vendor ratio is beyond the scope of this thesis.

H. CHAPTER SUMMARY

According to Werner (1995):⁴¹

capitation is healthcare reform risk sharing. Furthermore, capitated supply contracting provides a market basket of supply items within a budgeted amount of money. The partnership that ensues, he said, manages that budget within a framework of the 20% of products that account for 80% of a hospital's supply costs. Savings are derived from a combination of breaks on item pricing, reductions in product utilization, and value analysis.

This thesis outlined standardization strategies using the Pareto principle of inventory management.⁴² Furthermore, it has applied an ABC Analysis strategy to support standardization efforts throughout the MTF.⁴³ Product utilization, both clinically and in operating room, has to be highly scrutinized if DoD is going to reduce overall supply consumption costs. Capitated supply contracting is a risky venture which has the potential to reduce system-wide consumable supply costs. Capitated supply contracts are being seriously scrutinized and considered in today's

⁴¹ Werner, C. (1995). DeRoyal parley punches hot button: capitated supply pacts. Health Industry today. January, 1995. 13.

⁴² Ibid.

⁴³ Ibid.

healthcare industry as an efficient and effective way to control costs.

The advent of capitation throughout DoD has led to a situation where MTF commanders are being placed at increasing levels of risk regarding their spending patterns and yearly budget management. Therefore, DoD should carefully study risk sharing agreements. The purpose of this thesis is not to say that capitated supply contracting is the panacea for DoD medical inventory challenges. It is merely an idea and alternative that requires further investigation.

VIII. CONCLUSION AND RECOMMENDATIONS

A. SUMMARY OF ANSWERS TO RESEARCH QUESTIONS

This thesis addressed four primary research questions:

1. Can OSD(HA) predict surgical demand?

DoD can forecast surgical demand at each MTF. Demand can be determined by: sophisticated regression analysis; reviewing BUMED staffing policies that affect supply-side constraints and applying a Lagrangian model; or, using the simplified mathematical approach. This mathematical approach involves identifying MTF case-specific incidence rates, applying Monte Carlo simulation, and finally adjusting for population changes in the MTF catchment areas.

2. If demand can be accurately predicted, can regional standardization plans be implemented to support capitated contracting?

Regional standardization initiatives will be a normal outgrowth of standardization initiatives undertaken by individual MTFs. Any centralized standardization initiative will be futile unless MTFs commanders are proactive and willing to standardize disposable supplies at the unit level. Capitated contracting for these supplies is one alternative to reducing total system costs. Other alternatives exist.

3. Can the Defense Supply Center, Philadelphia (DSCP) establish DoD-wide regional contracts to support

yearly demand for disposable pre-pack surgical supplies?

DSCP can and should implement DoD contracts for disposable pre-pack surgical supplies. These contracts should be established using regional demand. BUMED is moving to a 100% capitated environment for all stateside MTFs and therefore, capitated supply contracting is a logical approach to addressing cost control mechanisms.

- 4. What supply-side determinants exist at the MTF level? For example, does the number and mix of surgeons that a particular MTF has onboard explain the total amount of surgical cases done within a given year?**

Patients and the demand for surgical procedures exceeds the surgeons capacity to supply procedures at MTFs. This thesis has identified some key supply-side determinants that limit the number of surgical cases performed by any MTF. Those limitations are capital equipment, number and specialty of surgeons, availability of operating room and ward nurses, and lastly, specialty trained hospital corpsmen. Therefore, the number of surgical cases may not be a function of the population, but more a function of how the hospital is currently staffed.

B. CONCLUDING COMMENTS

This research has thoroughly answered each research question. Furthermore, it has provided a process to identify surgical demand, establish a standardization

committee, and then capitate supply contracts throughout DoD.

Beneficiaries deserve the best healthcare military medicine can afford. Military medicine is at a critical turning point in its history. DoD is caught squarely in the maelstrom of public-sector and private-sector events that are transforming the U.S. healthcare industry. These events require all healthcare systems to significantly change how they do business. OSD(HA) has taken a major step in this direction by implementing consolidation plans for medical logistics functions at MTFs. However, this alone will not ensure OSD(HA's) future success. New relationships among MTFs and other civilian healthcare organizations, third-party logistic companies, and consultants must be forged if DoD wants to keep pace with an ever-changing industry.

Several processes and initiatives were discussed in this thesis. They include tri-service Regionalization of medical logistics functions, outsourcing, forecasting surgical demand, standardizing nondurable surgical and clinical supplies throughout MTFs, and establishing capitated supply contracting.

C. CONCLUSIONS

1. **OSD(HA) should regionalize medical logistics assets around existing Tricare Lead Agent regions**

MHS planners are moving away from the MTF view of logistics management in which purchasing, management, warehousing, distribution, and maintenance of medical supplies and equipment is conducted independently by each MTF. Regionalization and outsourcing initiatives are the wave of the future for military medicine. OSD(HA) is organizing logistics functions into business units that will guide logistics support functions for MTFs within a particular region. It is estimated that this reorganization will reduce total logistics administration, acquisition, and distribution costs by 10 to 25%.⁴⁴

2. **OSD(HA) should outsource non-governmental medical logistic functions following regionalization.**

Outsourcing is an agreement where DoD would contract for services rather than provide the service using existing assets. Some of the benefits include gaining state-of-the-art information technology that exposes DoDs entire supply chain to a ready workforce that are experts in their field. Furthermore, outsourcing medical logistics to a third-party organization means that the organization brings with them purchasing strategies that could provide tremendous savings.

⁴⁴ Ibid.

3. OSD(HA) should be able to predict demand for surgical procedures at individual MTFs.

Chapter five illustrated a process that OSD(HA) can use to forecast surgical demand at MTFs. Predicting yearly surgical demand using reliable operating room and managed care data is possible. BUMED has access to each MTFs catchment area demographics, to include age, gender, and race. OSD(HA) can use this data along with surgical supply information at each MTF to develop incidence rates for any surgical procedure. Using incidence rates as a baseline, this thesis has developed a process, using Crystal Ball® and Monte Carlo simulation, to predict future incidence rates for a selected number of surgical procedure.

4. Currently, there is no OSD(HA)-wide initiative to standardize nondurable supplies at Medical Treatment Facilities.

In an era where MTF commanders are constantly being pressured to cut costs, standardizing nondurable surgical and clinical products by reducing choice or eliminating some product lines can generate substantial savings. Unfortunately, limiting physician choice is difficult, even for military medicine. If it is done effectively, standardization has the potential to revolutionize the way DoD does business.

Any standardization initiative must be clinically driven involve doctors, nurses, and corpsmen. Product

selection should be centered on the 80/20 rule. Focus on those items that constitute 20% of inventory and 80% of the inventory investment. This information is readily available through existing Prime Vendor databases. Two material and methods sub-committees should be established along surgical and clinical pathways, with the surgical subcommittee standardizing items included in custom prepack surgical kits. There must be a well established time-line for committee members to follow.

The standardization process cannot be too absolute or uncompromising in it's objectives. It should not be totally motivated by cost reduction. Other non-cost benefits must be considered when selecting products for standardization. Finally, when faced with the decision to reduce cost or to maintain a standard of care, standard of care must have priority. Any decision that jeopardizes patient outcome can be very costly in the long run.

- 5. Medical Treatment Facilities are budgeted on a per beneficiary, per year basis. Likewise, nondurable supply consumption should be capitated as discussed in this thesis.**

Capitated supply contracting, although relatively new to the healthcare industry, has already proven to be an effective cost reduction alternative for some healthcare

institutions.⁴⁵ Any purchasing strategy undertaken by OSD(HA) must improve the way materials are managed - not just the way they are bought. Capitated supply contracting fundamentally changes the way materials are managed. DoD should migrate toward partnerships where distributors and vendors share in the savings or loss.

D. RECOMMENDATIONS

- 1. Define supply-side determinants and analyze their impact on surgical output at MTFs.**
- 2. Standardize all nondurable surgical and clinical supplies throughout MTFs.**
- 3. Determine if outsourcing all or part of the medial logistics functions at MTFs is beneficial to the overall mission of navy medicine. Define the outsourcing impact on mission readiness.**
- 4. Using demand forecasting as the foundation, investigate and further develop capitated supply contracts around already existing Tricare Lead Agent regions.**

This thesis has identified several opportunities for future research, including: outsourcing all or part of DoD medical logistics functions at MTFs, regionalizing medical logistics functions throughout military medicine, and implementing capitated supply contracting as a cost-cutting and risk sharing tool. These initiatives, if analyzed more

⁴⁵ Werner, C. (1994). Baxter blazes trail with three capitated supply contracts. Hospital Materials Management. Volume 19. Number 8. 1-3.

thoroughly, could provide DoD policy makers clearer insight for potential system-wide savings. The potential financial savings from integrating third-party vendors could enable DoD to recapitalize MTFs throughout the world.

INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center2
8725 John J. Kingman Rd, Ste 0944
Fort Belvoir, VA 22060-6218
2. Dudley Knox Library2
Naval Postgraduate School
411 Dyer Road
Monterey, CA 93943-5101
3. Professor William R. Gates, Ph.D1
Department of Systems Management
Naval Postgraduate School
Monterey, CA 93943
4. Commander Dave Smith1
Department of Systems Management
Naval Postgraduate School
Monterey, CA 93943
5. Commanding Officer,1
Naval Medical Logistics Command
521 Friam Street
Fort Detrick, MD 21702-5015
5. Commanding Officer,1
Naval Hospital, Camp Pendleton
Camp Pendleton, CA
6. LCDR William Bradley1
Naval Medical Logistics Command
521 Friam Street
Fort Detrick, MD 21702-5015
7. Commander Richard Cocrane MSC,USN1
The Joint Staff/J-4 Space MRD
The Pentagon, Room 2D828
Washington, D.C. 20318-4000
8. Mr. Jamie Kowalski1
Kowalski-Dickow Associates
PO Box 17678
Milwaukee, WI 53217
Attn: Mr. Jamie Kowalski

9. Service Medical Consulting1
Attn: Mr. Frank Fosco
1020 E. Monroe
Springfield, IL 62701
10. Mr. Scott McMartin1
Isolyser, Inc.
251 Exchange Place
Herndon, VA 20170
11. Mrs. Cathy Graham Minnick1
17 Laurel Tree Drive
Westampton, NJ 08060